قسم الهندسة الميكانيكية
المقررات الدراسية

المستوى الدراسي الاول (الفصل الاول)									
اسم المتطلب	نوع المتطلب	اسم المقـــــرر		عدد الساعات النظرية	عدد الساعات العملية	عدد الوحدات	الممهد ان وجد	رمز المقرر	الملاحظات
	(اجباري – اختياري)	باللغة العربية	باللغة الإنكليزية						
متطلبات الجامعة	اجباري	اللغة العربية	Arabic Language	2	0	2		UOMC100	
متطلبات الكلية	اجباري	الرياضيات I	Calculus I	3	0	3		ENGC121	
	اجباري	الرسم الهندسي	Engineering Drawing	0	3	1		ENGC123	
	اختياري	الفيزياء	Physics	2	0	2		ENGE133	اجباري لطلبة القسم
متطلبات القسم	اجباري	الميكانيك الهندسي السكون I	Engineering Mechanics-Statics I	3	0	3		MEC101	
	اجباري	عمليات تصنيع I	Manufacturing Processes I	2	3	3		MEC102	
	اجباري	برمجة الحاسوب I	Computer Programming I	1	2	2		MEC103	
	اجباري	مقدمة في الهندسة الكهربائية	Introduction to Electrical Engineering	2	2	3		MEC104	
		مجموع ساعات ووحدات الفصل الدراسي الأول		15	10	19			

المستوى الدراسي الاول (الفصل الثاني)									
اسم المتطلب	نوع المتطلب	اسم المقـــــرر		عدد الساعات النظرية	عدد الساعات العملية	عدد الوحدات	الممهد ان وجد	رمز المقرر	الملاحظات
	(اجباري – اختياري)	باللغة العربية	باللغة الإنكليزية						
متطلبات الجامعة	اجباري	لغة انكليزية للمبتدئين	English for Beginner	3	0	3		UOMC101	
	اجباري	الحاسوب	Computer	2	2	3		UOMC102	
	اجباري	حقوق وحريات	Human Rights and Freedom	2	0	2		UOMC103	
	اختياري	تلوث بيئة	Environmental Pollution	2	0	2			يختار الطالب مقرر واحد فقط ، عدد الوحدات المطلوبة = 2 وحدة
	اختياري	تقنيات المعلومات	Information Technology	2	0	2			
	اختياري	تاسيسات كهربائية	Electrical Installation	2	0	2			
	اختياري	نمذجة معلومات البناء	Modeling of Building Materials	2	0	2			
متطلبات الكلية	اجباري	الرياضيات II	Calculus II	3	0	3	الرياضيات I	ENGC122	
	اجباري	الرسم بمساعدة الحاسوب	Computer Aided Drawing	0	3	1	الرسم الهندسي	ENGC124	
متطلبات القسم	اجباري	الميكانيك الهندسي السكون II	Engineering Mechanics-Statics II	2	0	2	الميكانيك الهندسي السكون I	MEC151	
	اجباري	فيزياء المعادن I	Metallurgy Physics I	2	3	3	عمليات تصنيع I	MEC152	
	اجباري	برمجة الحاسوب II	Computer Programming II	1	2	2	برمجة الحاسوب I	MEC153	
		مجموع ساعات ووحدات الفصل الدراسي الثاني		17	10	21			

المستوى الدراسي الثاني (الفصل الاول)									
اسم المتطلب	نوع المتطلب	اسم المقـــــرر		عدد الساعات النظرية	عدد الساعات العملية	عدد الوحدات	الممهد ان وجد	رمز المقرر	الملاحظات
	(اجباري – اختياري)	باللغة العربية	باللغة الإنكليزية						
متطلبات الجامعة	اجباري	اللغة الانكليزية - ماقبل المتوسط	English Language - Pre Intermediate	1	0	1			وتحتسب لكل مستوى دراسي وقد تستغرق ثلاثة سنوات في
متطلبات الكلية	اختياري	رياضيات هندسية I	Engineering Math I	3	0	3	رياضيات II	ENGE228	اجباري لطلبة القسم
	اجباري	ديناميك الحرارة I	Thermodynamics I	3	0	3	الفيزياء	MEC201	
	اجباري	ميكانيك المواد I	Mechanics of Materials I	3	0	3	ميكانيك هندسي-السكون II	MEC202	

متطلبات القسم	اجباري	ميكانيك الموائع I	Fluid Mechanics I	3	0	3	الفيزياء	MEC203	
	اجباري	الرسم الميكانيكي	Mechanical Drawing	0	3	1	الرسم بمساعدة الحاسوب	MEC204	
	اجباري	الفيزياء للمهندسين	Physics for Engineers	3	0	3	الفيزياء	MEC205	
	اجباري	الميكانيك الهندسي-الحركة	Engineering Mechanics-Dynamics	3	0	3	الميكانيك الهندسي-السكون II	MEC206	
		مجموع ساعات ووحدات الفصل الدراسي الأول		19	3	20			

المستوى الدراسي الثاني (الفصل الثاني)

اسم المتطلب	نوع المتطلب (اجباري – اختياري)	اسم المقـــــرر باللغة العربية	اسم المقـــــرر باللغة الإنكليزية	عدد الساعات النظرية	عدد الساعات العملية	عدد الوحدات	الممهد ان وجد	رمز المقرر	الملاحظات
متطلبات الكلية	اجباري	الاقتصاد الهندسي	Engineering Economics	2	0	2		ENGC226	
	اجباري	الاحصاء	Statistics	2	0	2		ENGC227	
	اختياري	رياضيات هندسية II	Engineering Math II	3	0	3	رياضيات هندسية I	ENGE230	اجباري لطلبة القسم
متطلبات القسم	اجباري	ديناميك الحرارة II	Thermodynamics II	3	0	3	ديناميك الحرارة I	MEC251	
	اجباري	ميكانيك المواد II	Mechanics of Materials II	2	0	2	ميكانيك المواد I	MEC252	
	اجباري	ميكانيك الموائع II	Fluid Mechanics II	2	0	2	ميكانيك الموائع I	MEC253	
	اجباري	الرسم الميكانيكي بمساعدة الحاسوب	Computer Aided Mechanical Drawing	1	3	2	الرسم الميكانيكي	MEC254	
	اجباري	المختبرات I	Mechanical Engineering Laboratory I	0	3	1		MEC256	
	اختياري	تطبيقات هندسية بمساعدة الحاسوب	Computer Aid Engineering Applications	0	2	1		MEC260	يختار الطالب مقرر واحد . عدد الوحدات المطلوبة =2 وحدة
	اختياري	الاختبارات اللاتلافية	Non-Destructive Testing	1	0	1	فيزياء المعادن I	MEC261	
		مجموع ساعات ووحدات الفصل الدراسي الثاني		15/16	2/4	18			

المستوى الدراسي الثالث (الفصل الاول)

اسم المتطلب	نوع المتطلب (اجباري – اختياري)	اسم المقـــــرر باللغة العربية	اسم المقـــــرر باللغة الإنكليزية	عدد الساعات النظرية	عدد الساعات العملية	عدد الوحدات	الممهد ان وجد	رمز المقرر	الملاحظات
متطلبات الجامعة	**اجباري**	اللغة الانكليزية -المتوسط	English Language - Intermediate	2	0	2			
متطلبات الكلية	**اجباري**	الادارة الهندسية	Engineering Management	2	0	2		ENGC325	
متطلبات القسم	**اجباري**	التحليلات الهندسية	Engineering Analysis	3	0	3	الرياضيات الهندسية I	MEC301	
	اجباري	انتقال الحرارة بالتوصل	Conduction Heat Transfer	3	0	3	ديناميك الحرارة II	MEC302	
	اجباري	التحليل الحركي	Kinematic Analysis	2	0	2	ميكانيك المواد II	MEC303	
	اجباري	مكائن كهربائية	Electric Machines	2	0	2	مقدمة في الهندسة الكهربائية	MEC304	
	اجباري	الورشة الميكانيكية	Mechanical Workshop	0	2	1	عمليات التصنيع I	MEC305	
	اختياري	جريان الموائع المنضغطة	Compressible Fluid Flow	3	0	3	ميكانيك الموائع II	MEC331	يختار الطالب مقرر واحد . عدد الوحدات المطلوبة =2 وحدة
	اختياري	المعادن	Metallurgy	2	2	3	فيزياء المعادن I	MEC332	
		مجموع ساعات ووحدات الفصل الدراسي الأول		16/17	2/4	18			

المستوى الدراسي الثالث (الفصل الثاني)

اسم المتطلب	نوع المتطلب (اجباري – اختياري)	اسم المقـــــرر باللغة العربية	اسم المقـــــرر باللغة الإنكليزية	عدد الساعات النظرية	عدد الساعات العملية	عدد الوحدات	الممهد ان وجد	رمز المقرر	الملاحظات
متطلبات الجامعة	**اجباري**	اخلاقيات المهنة	Professional Ethics	2	0	2		UOMC104	
متطلبات الكلية	**اختياري**	السلامة العامة	Public Safety	2	0	2		ENGE329	اجباري لطلبة القسم
	اختياري	التحليل العددي	Numerical Analysis	2	0	2	الرياضيات I، II	ENGE320	اجباري لطلبة القسم
متطلبات القسم	**اجباري**	انتقال الحرارة بالحمل والاشعاع	Convection and Radiation Heat Transfer	2	0	2	انتقال الحرارة بالتوصل	MEC352	
	اجباري	مقدمة في تصميم المكائن	Introduction to Machine Design	3	0	3	التحليل الحركي	MEC353	

	اجباري	ديناميك المكائن	Machines Dynamics	2	0	2	التحليل الحركي	MEC354	
	اجباري	المختبرات II	Laboratories II	0	3	1	المختبرات I	MEC355	
	اختياري	المكائن التوربينية	Turbomachinery	2	0	2	جريان الموائع المنضغطة	MEC360	يختار الطالب مقرر واحد . عدد الوحدات المطلوبة =2 وحدة
	اختياري	المواد الهندسية المعدنية	Metallic-Engineering Materials	2	0	2	المعادن	MEC361	
	اختياري	مقدمة في الاحتراق	Introduction to Combustion	**2**	**0**	**2**	ديناميك الحرارة II	MEC362	يختار الطالب مقرر واحد . عدد الوحدات المطلوبة =2 وحدة
	اختياري	عمليات التصنيع المتوسطة	Intermediate Manufacturing Processes	**1**	**3**	**2**	عمليات الصنيع I	MEC363	
	اختياري	طاقة شمسية	Solar Energy	2	0	2		MEC364	يختار الطالب مقرر واحد . عدد الوحدات المطلوبة =2 وحدة
	اختياري	مقدمة في المواد المتراكبة	Introduction to Composite Materials	**2**	**0**	**2**	المعادن	MEC465	
	مجموع ساعات ووحدات الفصل الدراسي الثاني			18/19	3/6	20			

المستوى الدراسي الرابع (الفصل الاول)								
اسم المتطلب	**نوع المتطلب**	**اسم المقـــــرر**		**عدد الساعات**	**عدد الساعات العملية**	**عدد الوحدات**	**الممهد ان وجد**	**رمز المقرر**	**الملاحظات**
	(اجباري – اختياري)	**باللغة العربية**	**باللغة الإنكليزية**						
متطلبات القسم	اجباري	مقدمة في الاهتزازات	Introduction to Vibration	2	0	2	ديناميك المكائن	MEC401	
	اجباري	محطات قدرة	Power Plants	3	0	3	انتقال الحرارة بالحمل والاشعاع	MEC421	
	اجباري	تكييف الهواء	Air Conditioning	3	0	3	انتقال الحرارة بالحمل والاشعاع	MEC453	
	اجباري	مشروع التخرج I	Graduation Project I	2	0	2	اكمال جميع متطلبات المستوى الثالث	MEC404	
	اجباري	السيطرة والقياسات	Control and Measurements	3	0	3	تحليلات هندسية	MEC405	
	اختياري	مكائن الاحتراق الداخلي	Internal Combustion Engines	3	0	3	مقدمة في الاحتراق	MEC402	يختار الطالب مقرر واحد . عدد الوحدات المطلوبة =2 وحدة
	اختياري	المواد الهندسية اللامعدنية	Nonmetallic-Engineering Materials	3	0	3	المواد الهندسية المعدنية	MEC425	
	اختياري	طاقات متجددة	Renewable Energies	2	0	2		MEC422	يختار الطالب مقرر واحد . عدد الوحدات المطلوبة =2 وحدة
	اختياري	المرونة	Elasticity	2	0	2	المواد الهندسية المعدنية	MEC426	
	مجموع ساعات ووحدات الفصل الدراسي الأول			18	0	18			

المستوى الدراسي الرابع (الفصل الثاني)									
اسم المتطلب	**نوع المتطلب**	**اسم المقـــــرر**		**عدد الساعات النظرية**	**عدد الساعات العملية**	**عدد الوحدات**	**الممهد ان وجد**	**رمز المقرر**	**الملاحظات**
	(اجباري – اختياري)	**باللغة العربية**	**باللغة الإنكليزية**						
متطلبات الجامعة	اجباري	اللغة انكليزية - ما بعد المتوسط	English Language – Upper Intermediate	2	0	2			
متطلبات القسم	اجباري	تحليل وتصميم أنظمة التحكم	Design and analysis of control system	3	0	3	السيطرة والقياسات	MEC451	
	اجباري	المختبرات III	Laboratories III	0	3	1	المختبرات II	MEC452	
	اجباري	تصميم المكائن المتوسطة	Intermediate Machines Design	3	0	3	مقدمة في تصميم المكائن	MEC403	
	اجباري	مشروع التخرج II	Graduation Project II	2	0	2	تصميم مشروع البكالوريوس I	MEC454	
	اختياري	تلوث	Pollution	2	0	2		MEC461	يختار الطالب مقرر واحد . عدد الوحدات المطلوبة =2 وحدة
	اختياري	اللدونة	Plasticity	2	0	2	المرونة	MEC465	
	اختياري	التثليج	Refrigeration	3	0	3	ديناميك الحرارة 2	MEC462	يختار الطالب مقرر واحد . عدد الوحدات المطلوبة =2 وحدة
	اختياري	الاهتزازات المتوسطة	Intermediate Vibration	3	0	3	مقدمة في الاهتزازات	MEC467	
	اختياري	تصميم المكائن بالحاسوب	Computer Aided Machine Design	1	2	2	مقدمة في تصميم المكائن	MEC466	يختار الطالب مقرر واحد . عدد الوحدات المطلوبة =2 وحدة
	اختياري	تصميم الانظمة الحرارية بالحاسوب	Computer Aided Thermal System Design	1	2	2	تكييف الهواء	MEC463	
	مجموع ساعات ووحدات الفصل الدراسي الثاني			16	5	17			

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Calculus I
Course Number/Type: ENGC121 / Core
Credit Hours: 3 (3 lecture and 0 laboratory hours / week)
Level/Term: 1st level / Autumn
Prerequisties:

Course Description:	
Coordinates and Graphs in the Plane, Directions and Quadrants, Distance between Points,Graphs of Equations,Intercepts and More about Graphing,Slope and Equations for Lines,Slope of Non-vertical Lines,Lines That are Parallel or Perpendicular,Point – Slope Equations,Slope – Intercept Equations,Definition of functions, domain and range of functions, graph of functions, symmetry analysis	
Refernces:	
1- Calculus- Thirteenth edition /by Thomas	
Course Details:	
Subject	**Week**
Coordinates and Graphs in the Plane,Directions and Quadrants,Distance between Points.	1
Graphs of Equations,Intercepts and More about Graphing.	2
Slope and Equations for Lines,Slope of Non-vertical Lines.	3
Lines That are Parallel or Perpendicular,Point – Slope Equations,Slope – Intercept Equations.	4
Definition of functions, domain and range of functions, graph of functions**.**	5
symmetry analysis: odd and even functions test , shifting of functions ,equation of straight lines.	6
trigonometric functions and their identities, limits of fundamental functions.	7
limits of trigonometric functions ,sandwich theorem, limit when x approaches infinity.	8
introduction to derivative, differentiation by definition, differentiations rules.	9
differentiation of trigonometric functions, The Chain Rule, Implicit Differentiation.	10
Applications of Derivatives, related rate, Extreme Values of Functions.	11
Concavity, Curve Sketching with y' and y", Points of Inflection.	12
Horizontal and Vertical Asymptotes , Oblique Asymptotes, Applied Optimization.	13
Matrices,Basic Definitions,Addition, Subtraction and Multiplication.	14
Determinants,The Inverse of a 3 x 3 Matrix,Cramers Rule,Gaussian Elimination.	15

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Calculus II
Course Number/Type: ENGC122 / Core
Credit Hours: 3 (3 lecture and 0 laboratory hours /week)
Level/Term: 1st level / Spring
Prerequisties: ENGC121 Calculus I

Course Description:

At the end of this course, the student will be able to find the following topics: Area and Estimating with Finite Sums, The Definite Integral, The Fundamental Theorem of Calculus, Indefinite Integrals and the Substitution Method, Definite Integral Substitutions and the Area between Curves, Volumes Using Cross-Sections, Volumes Using Cylindrical Shells, Arc Length., Areas of Surfaces of Revolution, Using Basic Integration Formulas, Integration by Parts, Trigonometric Integrals, Trigonometric Substitutions, Integration of Rational Functions by Partial Fractions.

Refernces:

Calculus and Analytic Geometry by George B. Thomas, any edition.

Course Details:

Subject	Week
Area and Estimating with Finite Sums. The Definite Integral.	1
The Fundamental Theorem of Calculus.	2
Indefinite Integrals and the Substitution Method.	3
Definite Integral Substitutions and the Area between Curves.	4
Volumes Using Cross-Sections.	5
Volumes Using Cylindrical Shells.	6
Arc Length.	7
Areas of Surfaces of Revolution.	8
The Logarithm Defined as an Integral.	9
Hyperbolic Functions.	10
Using Basic Integration Formulas.	11
Integration by Parts.	12
Trigonometric Integrals.	13
Trigonometric Substitutions.	14
Integration of Rational Functions by Partial Fractions.	15

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Auto - CAD
Course Number/Type: ENGC124 / Core
Credit Hours: 1 (0 lecture and 3 laboratory hours / week)
Level/Term: 1st level / Spring
Prerequisties: ENGC123 Engineering Drawing

Course Description:	
The subject is about teaching students engineering drawings using AutoCAD. Teaching the subject includes both theoretical lectures and Lab. Tutorials.	
Refernces:	
Autodesk AutoCAD 2018 online Help	
Course Details:	
Subject	**Week**
1- Start a new drawing. 2- User Interface. 3- Drafting settings I (Snap, Rectangular & Isometric grid). 4- Limits. 5- Units. 6- Absolute & Relative coordinate system (Polar & Absolute). 7- Ortho.	1-2
Drawing I (Line, Arc, Circle, Ellipse, Polygon, Rectangle)	3-4
Drawing II, View. (1- Zoom, Pan, 2- Drafting settings II.(Osnap, Polar snap). 3- Pline, Pedit. 4- Erase. 5- Selecting objects. 6- Ltype, Ltscale)	5
Modify I, Drawing III: (1-Copy, Rotate, Move, Scale, Stretch. 2- Undo, U, Redo. 3-, Lweight. 4- Divide, Measure.5- Point (DDPTYPE)).	6
Layers, Modify II: (1- Working with Layers. 2- Properties (Mo, Ch). 4- Working with Grips.)	7
Modify III. (1- Array, Offset, Fillet, Chamfer, Trim, Extend)	8-9
Modify III. (Lengthen, Mirror, Break, Join, Explode.)	10
Annotation I, Modify IV, Inquiry: 1-Style, Text, Mtext, Ddedit,. 2- ID, Dist, Area, Massprop	11
Annotation II: (1- Dimensions & Leaders.)	12
Hatch, Hatchedit..	13
Block I: 1- Block, Insert. 2- Wblock. 3- Image, Draworder.4-plot	14
Template Drawings. Applications	15

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Computer programming I
Course Number / Type: MEC103 / Core
Credit Hours: 2 (1 lecture and 2 laboratory hours / week)
Level/Term: 1st level / Autumn
Prerequisties:

Course Description:

In this course many topics learned as :Programming principles, Algorithm and flow charts, Data input and results output, Arithmetic statements and the rules of precedence and mathematical functions, Control statements, variables storage in computer memory. Also, Visual basic environment, Visual basic tools, Form design, Input output data, relations ships coefficients, control statements in visual basics. And finally, Arrays in Visual Basic: Declaring arrays, One Dimension Array, Two Dimensional Arrays.

Refernces:

1- Prof.Dr.abdul-mutaleb I.Ahmed 2004 "Visual Basic" first Edition , alfarah.
2- Turky Alosayre 2002 "Visual Basic for all" first edition .
3- Dr. Mahdi Fadel 1992 "programming using basic language" first Edition.
4- Prof.Dr. yehya s. Alhalaby & Dr.mohammed B. Alzaabe 2001"Visual basic 6.0&quot.

Course Details:

Subject	**Week**
Fundamental of Programing , Algorithm, Flow charts	1
Variables and Costands	2
Visual basic environment	3
Visual basic tools	4
Form design	5
Principles of programming	6
Arithmetic operations on data	7
Exam	8
Visual Basic Functions	9
Input and output data	10
Exam	11
Releations	12
Control statements : Goto Statements	13
Arrays in Visual Basic: Declaring arrays, One Dimension Array, Two Dimensional Arrays.	14
Exam	15

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Computer programing II
Course Number/Type: MEC153 / Core
Credit Hours: 2 (1 lecture and 2 laboratory hours / week)
Level/Term: 1st level / Spring
Prerequisties: MEC103 Computer programing I

Course Description:	
MATLAB for Engineers introduces students to the MATLAB coding language. Developed out of Holly Moore's experience teaching MATLAB and other languages, the text meets students at their level of mathematical and computer sophistication. Starting with basic algebra, the course shows how MATLAB can be used to solve a wide range of engineering problems.	
Refernces:	
1- Matlab for engineers 2- introducation to matlab	
Course Details:	
Subject	**Week**
Introduction to Matlab	1
Supporting Windows	2-3
Numbers & Formats	4
Matlab Basic Operations	5-6
Matrices Construction	7-8
Vectors construction	9
Control Structures	10-11
Med term exam	12
Review and Discussion	13-14
Evaluation Test	15

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Engineering Drawing
Course Number/Type: ENGC123 / Core
Credit Hours: 1 (0 lecture and 3 laboratory hours / week)
Level/Term: 1st level / Autumn
Prerequisties:

Course Description:	
The course will cover the basic of engineering drawing which is how to draw line, circle, curve and angle. This is one part in this course , will be focused in engineering drawing .	
Refernces:	
1- William D.callister Jr.&David D.Rrthwisch(2010)" Material Science and Engineering An introduction " eight Edition 2- D.R.Askeland (2011) " The Scinence and engineering of materials"	
Course Details:	
Subject	Week
Introduction to engineering drawing and its tools ,	1
The types of line and its properties	2
Different engineering operations	3
Different engineering operations	4
Different engineering operations	5
The theory of the vertical projection of the body	6
The theory of the vertical projection of the body	7
The theory of the vertical projection of the body	8
The theory of the vertical projection of the body	9
Isometric projection	10
Isometric projection	11
Isometric projection	12
Isometric projection	13
Conclusion the missing view	14-15

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Engineering Mechanics Static I
Course Number/Type: MEC101/ Core
Credit Hours: 3 (3 Lecture and 0 laboratory hours / week
Level/Term: 1st level / Autumn
Prerequisties:

Course Description:	
Introduction of engineering mechanics and Newton´s laws, Force system, Moments, Moments and Couple, Resultants, Equilibrium, Structures, Plane Trusses	
Refernces:	
1- Engineering Mechanics Statics, J.L. Meriam and L. G. Kraige, Sixth Edition, John Wiley & Sons 2- Engineering Mechanics Statics; R. C. Hibbeler , Twelfth Edition in SI Units, Prentice Hall.	
Course Details:	
Subject	**Week**
Introduction to Engineering Mechanics 1	1
Force systems, Components of force	2
Force systems Scalars and Vectors, Vector Operations, Vector Addition of Forces.	3
Moments of force	4
Moments of Couple.	5
Resultants of Forces	6
Resultants of Moment, moments of couple	7
Equilibrium of a Rigid Body	8
Equilibrium and types of reactions	9
Conditions for Rigid-Body Equilibrium	10
The Free-Body Diagram, Equations of Equilibrium	11
Structural Analysis	12
Simple Trusses	13
Method of Joints	14
Method of Sections	15

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Engineering Mechanics Static II
Course Number/Type: MEC151 / Core
Credit Hours: 2 (2 lecture 0 laboratory hours / week)
Level/Term: 1st level / Spring
Prerequisties: MEC101 Statics I

Course Description:

This course aims to develop students' capacity to predict the effects of forces, moments, couples and the distributed loads that are applied to bodies. Also, application of equilibrium principle to frames are presented. The course offers basic knowledge of the physical and mathematical principles of mechanics in different subjects such as frames and machines, distributed forces, centers of gravity and centroid, composite bodies and figures, friction, dry Friction, flexible belt, area moments of Inertia.

Refernces:

1- Engineering Mechanics Statics, J.L. Meriam and L. G. Kraige, Sixth Edition, John Wiley & Sons. (can be downloaded from the Course web page).
2- Engineering Mechanics Statics; R. C. Hibbeler , Twelfth Edition in SI Units, Prentice Hall. (can be downloaded from the Course web page).
3- Engineering Mechanics Statics and Dynamics, Bedford & Fowler, Prentice Hall.

Course Details:

Subject	**Week**
Structures (Frame and Machine)	1-2
Distributed Loading	3-4
Beams-Internal Effects	5-6
Friction	7
Application of Friction in Machines	8
Centre of gravity the centre of mass and centroid of a body	9-10
Composite Bodies (application of centr of centroid)	11
Definition of moments of inertia for areas, the radius of gyration	12
Comosite bodies (application of moment of inertia for area)	13
Mass moment of inertia	14
Final Exam	15

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: English Languge
Course Number/Type: UOMC101/Core
Credit Hours: 3 (3 lecture and 0 laboratory hours / week)
Level/Term: 1st level / Spring
Prerequisties:

Course Description:
This course emphasizes the fundamental language skills of reading, writing, speaking, listening, thinking, viewing and presenting. The course includes studies of various literary genres: short story, novel, and non-fiction. The course also helps students to improve their listening and speaking abilities, and becoming more effective use of grammar and natural self-expression in English .
Refernces:
1- Ronald Carter and Michael McCarthy, Cambridge grammar of English: A comprehensive guide. Cambridge: Cambridge University Press, 2006. 2- The Cambridge Grammar of the English Language. Huddleston, Rodney, Pullum, Geoffrey K. 3- Collins Reading for IELTS by Els Van Geyte, 2011.
Course Details:

Subject	**Week**
Parts of speech	1
Basic English Sentence Structure	2 & 3
Pronouns	4
Tenses	5 & 6
Active voice	7
Passive voice	8
Positive, comparative and superlative. Conditional sentences, if-clauses type I, II, III.	9
Reading	10 & 11
Writing	12 & 13
Listining	14
Speaking	15

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Human Rights and Freedom
Course Number/Type: UOMC103/Core
Credit Hours: 2 (2 lecture and 0 laboratory hours / week)
Level/Term: 1st level / Spring
Prerequisties:

Course Description:

حقوق الإنسان هي المبادئ الأخلاقية أو المعايير الاجتماعية التي تصف نموذجاً للسلوك البشري الذي يُفهم عموما بأنه مجموعة من الحقوق الأساسية التي لا يجوز المس بها وهي مستحقة وأصيلة لكل شخص لمجرد كونها أو كونه إنسان، فهي ملازمة لهم بغض النظر عن هويتهم أو مكان وجودهم أو لغتهم أو ديانتهم أو أصلهم العرقي أو أي وضع آخر .

Refernces:

Course Details:

Subject	Week
تعريف حقوق الانسان	1
خصائص حقوق الانسان	2
مصادر حقوق الانسان	3
انواع حقوق الانسان	4
القيود الواردة على حقوق الانسان	5
واجبات الافراد وحقوقهم	6
ضمانات حقوق الانسان على الصعيد الدولي	7
ضمانات حقوق الانسان على الصعيد الدولي	8
ضمانات حقوق الانسان على الصعيد الوطني	9
الفساد الاداري وانواعه واثار الفساد الاداري على حقوق الانسان	10
طرق ووسائل مكافحة الفساد الاداري	11
الديمقراطية وانواعها وميزاتها وعيوبها	12
مبدأ الفصل بين السلطات واثره على حقوق الانسان	13
حق الشعوب في تقرير المصير وحق الفرد في اكتساب الجنسية والحقوق الجماعية للانسان	14-15

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Manufacturing Processes I
Course Number/Type: MEC102 / Core
Credit Hours: 3 (2 lecture and 3laboratory hours / week)
Level/Term: 1st level / Autumn
Prerequisties:

Course Description:

Manufacturing can be basically defined as an addition processes by which raw materials of low utility and value due to it's inadequate material properties and poor or irregular size, shape and finishing are converted into high utility and valued products with definite dimensions, forms and finish imparting some functional ability. An introduction tothe principle of the manufacturing processes, properties of materials, types of materials, types of manufacturing processes, general consideration of manufacturing, selection methods of production, casting processes and production offerrous metals in addition to workshop laboratory will be covered .

Refernces:

الوسيط في هندسة الانتاج (تأليف : الدكتور حسين رجب السيد دار الراتب الجامعية / بيروت - 1984
مباديء عمليات الانتاج (تأليف : الدكتور قحطان خلف الخزرجي و الدكتور عادل محمود حسن مطبعة التعليم العالي (الطبعة الثانية) / بغداد - 1987
. Manufacturing processes. B.H.Amsted, Philip F. Ostward& Myron L. Begeman.-8th Edition 2005, John Wily & Sons

Course Details:

Subject	Week
Processes of precise measurement / Engineering materials / physical properties. Workshop lab	1
I-T International Tolerance / Mechanical properties. Workshop lab	2
Clearance fits /ferrous metals. Workshop lab.	3
Interference fits /High furnace for the production of cast iron. Workshop lab.	4
Sources of Error in measurement / production of steel (part 1). Workshop lab.	5
Geometric errors / production of steel (part 2). Workshop lab.	6
Metal cutting / production of non-ferrous metals. Workshop lab.	7
Cutting tool material /characterization of cutting tool / Die casting. Workshop lab.	8
Type of cutting tools / Type of chip formation /plastic forming of metals (Rolling). Workshop lab.	9
Tool life (T) / plastic forming of metals (Extrusion). Workshop lab.	10
Tool life for max production /plastic forming of metals (Drawing). Workshop lab.	11
Tool life for min production cost / Welding (part 1).Workshop lab.	12
Reich ratio / Welding (part 2). Workshop lab.	13
Tangential velocity for special cases / Welding (part 3). Workshop lab.	14
Solve examples / Welding (part 4). Workshop lab.	15

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Metallurgy Physics I
Course Number/Type: MEC152 / Core
Credit Hours: 3 (2 lecture and 3 laboratory hours / week)
Level/Term: 1st level / Spring
Prerequisties: MEC102 Manufacturing processes I

Course Description:

In MEC152, students will learn how bonding of metals occurs, how to classify the metals and alloys with its properties and microstructures, the defects occurred in the metals and alloys , types of thermal equilibrium diagrams, also the students will learn about the steels ,cast irons with their properties/applications/microstructures and finally the heat treatments of steels

Refernces:

1- "Engineering metallurgy I",R.A.Higgins,2008,London.
2- "Fundamentals of materials science and engineering",W.D.Callister,4th edition, John weleiy and sons,2012,USA.

Course Details:[Theoratical and practical course]

Subject	Week
Atomic structure & atomic bonding in materials	1
Crystalline structure of metals and miller indices.	2
Metals properties and Mechanical tests of metals.	3
Solidification and defects of metals.	4
Fracture of metals and strengthening methods of metals.	5
Cooling curves (types and construction).	6
Thermal equilibrium diagrams.	7
Solid solution thermal equilibrium diagram.	8
Combination type thermal equilibrium diagram	9
Simple eutectic thermal equilibrium diagram	10
Iron-carbon thermal equilibrium diagram	11
Steel portion (microstructures, properties and applications)	12
Cast iron (types and applications)	13
Heat treatment of steels.	14
Heat treatment based on T.T.T curve	15

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Physics
Course Number/Type: ENGE133/Core
Credit Hours: 2 (2 lecture and 0 laboratory hours /week)
Level/Term: 1st level / Autumn
Prerequisties:

Course Description:

The course objects demonstrates sequence in physics primarily for students intending to major in a field of mechanical, electrical, architectural and civil engineering. Calculus will be used as needed and should be taken at least concurrently.

Refernces:

Physics for scientists and engineers: An interactive approach. Robert Hawkes, Javed Iqbal, Firas Mansour, Marina Milner-Bolotin and Peter Williams. 2nd edition, 2019. / Engineering Mechanics: Dynamics - Volume 2. J.L. Meriam, L.G. Kraige and J. N. Bolton. 8th edition, 2015./ Principles of Heat Transfer; Frank Kreith, Raj M. Manglik; Cengage Learning, 2016./ Sound Analysis and Noise Control; John Foreman; Springer Science & Business Media, 2012.

Course Details:

Subject	Week
Introduction to physics; Standards of length, mass and time; Scalar and Vector quantities; Kinematics; Position, Displacement and Distance; Speed, Velocity and Acceleration; Forces and motion; Mass and gravity force; Newton's three laws of motion.	1
Spring forces and Hooke's law; Friction forces; Uniform circular motion; Work; Kinetic and Potential Energy; The work-kinetic energy theorem; Conservation of total mechanical energy; and Power.	2
Linear momentum; Momentum and kinetic energy; Rate of change of linear momentum and Newton's laws; Law of conservation of linear momentum; Impulse; and Simple Harmonic Motion.	3
Universal gravitation; Newton's law of universal gravitation; Free-fall acceleration and the gravitational force; and Solve problems using Newton's law of universal gravitation and calculate the gravitation for different locations.	4
Fluid mechanics; Pressure and density of fluid at different depth; Hydrostatic pressure; Pascal's principle and the operation of a hydraulic lift; Buoyant forces and Archimedes's principle; the equation of continuity for fluids; and the Bernoulli's equation.	5
Basic of Architectural Physics; and Solar Radiation.	6
Heat Transfer (Conduction, Convection, and Radiation).	7 & 8
Sound; Noise; Sound Intensity . Sound Insulation; and Thermal Behaviour of Materials	9-10
Atoms Structure; Atomic Energy Level; and Materials Used in Electronics.	11
Current and Voltage; electrical circuit; and Ohm's Law.	12
Power and Energy; and Parallel and Series Networks. Kirchhoff's Law.	13-14
Diodes and Transistors.	15

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Computer Aided Mechanical Drawing
Course Number/Type: MEC254 / Core
Credit Hours: 2 (1 lecture and 3 laboratory hours /week)
Level/Term: 2nd level / Spring
Prerequisties: MEC204 Mechanical Drawing

Course Description:

Demonstrate the creation of 3D geometry using software (AutoCAD). Demonstrate the techniques of specifying threads and fasteners. Describe the theory and techniques for creating detail and assembly drawings of complex machines. Present a model for the design process (problem identification, ideation, analysis and refinement, decision and implementation) from conception through working drawings.

Refernces:

1- Engineering Drawing and Design, David A. Madsen, 1989.
2- Mechanical Drawing Board & CAD Techniques, Student Edition, McGraw-Hill Education, 1997.

Course Details:

Subject	**Week**
Cams which are a rotating or sliding piece in a mechanical linkage used especially in transforming rotary motion into linear motion. It is often a part of a rotating wheel (e.g. an eccentric wheel) or shaft (e.g. a cylinder with an irregular shape) that strikes a lever at one or more points on its circular path.	1-2-3
Drawing using Auto CAD 3D and the students will draw a class work and take a home work.	4-5
Drawing the Gears, A gear or cogwheel is a rotating machine part having cut teeth, or in the case of a cogwheel, inserted teeth (called cogs), which mesh with another toothed part and the students will draw a class work and take a home work.	6
Drawing using Auto CAD 3D and the students will draw a class work and take a home work.	7-8
Drawing the Gears, A gear or cogwheel is a rotating machine part having cut teeth, or in the case of a cogwheel, inserted teeth (called cogs), which mesh with another toothed part and the students will draw a class work and take a home work.	9-10-11
Drawing using Auto CAD 3D and the students will draw a class work and take a home work.	12-13-14
Final Examination	15

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Engineering Economics
Course Number/Type: ENGC226 / Core
Credit Hours: 2 (2 lecture and 0 laboratory hours /week)
Level/Term: 2nd level / Spring
Prerequisites:

Course Objectives:	
The lectures include introducing engineering economics, project evaluation, and how to use engineering to reduce cost and achieve quality	
Course Details:	
Article	**Week**
الاقتصاد الهندسي (تعاريف ، مصطلحات ومفاهيم) Engineering Economics (Definitions, Concepts)	1-2
الفائدة والعلاقات الاقتصادية Interest and Economic relationships	2-3
والقيمة الزمنية لرأس المال capital time value التدفق النقدي Cash flow	3 - 4
المقارنة بين البدائل Comparison between alternatives طريقة القيمة الحالية present value Conceptالكلفة السنوية المكافئة Equivalent annual cost	5
التقييم الاقتصادي Economic Appraisal سعر الخصم discount Rate فترة الاسترداد Payback period معدل العائد الداخلي internal rate of return	6
الاستبدال Replacement	7-8
الاندثار Depreciation طريقة جمع ارقام السنوات (SOYDD) القسط الثابت (DBD)	9
التضخم inflation	10
نقطة التعادل Breakeven Point	11 - 12
تحليل الحساسية sensitivity analysis	13
الجدوى الاقتصادية والفنية feasibility Study	14-15

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Engineering Mathematics I
Course Number/Type: ENGC228 / Core
Credit Hours: 3 (3 lecture and 0 laboratory hours /week)
Level/Term: 2nd level / Autumn
Prerequisties: ENGC122 Calculus II

Course Description:

Function of two or more variables: Limits & Continuity, Partial derivatives, Second order partial derivatives, Chain rule for functions of two or three variables, Maxima and minima and saddle point ,Multiple integral: Double integral, Properties of double integral, Double integral over regions ,Iterated or revised integrals-finding the limits

Refernces:

1- Thomas Jr, G. B., Weir, M. D., Hass, J., Heil, C., & Edition, T. (2014). Early Transcendentals.
2- Kreyszig, Erwin. "Advanced Engineering Mathematics, 10th Eddition." (2009).

Course Details:

Subject	Week
Limits & Continuity, Partial derivatives, Second order partial derivatives	1
Chain rule for functions of two or three variables, Maxima and minima and saddle point	2
Double integral, Properties of double integral, Double integral over regions	3
Iterated or revised integrals-finding the limits of integration	4
Average Value ,Areas, moments, and center of mass, Double integrals in polar form Integrals in polar coordinates	5
Limits of integration In polar form, Changing Cartesian integrals into polar form, Triple integrals, Properties of triple integrals	6
Evaluation of triple integrals, Triple integrals in cylindrical coordinates Application.	7
Trigonometric form of Fourier Series, Wave form Symmetry :Odd and Even Functions	8
Half Wave Symmetry, Sum and Shift of function Line Spectrum (harmonic) the Fourier Series	9
Complex Exponential form of the Fourier Series	10
Fourier Transformation	11
Introduction to Vectors: definition, notation	12
Vector algebra: addition, subtraction, multiplications, Vector functions: lines	13
Vector differential calculus: derivative, Gradient	14
Laplacian, divergence, curl. Eigen values and Eigen vectors.	15

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Engineering Mathematics II
Course Number/Type: ENGE230 / Core
Credit Hours: 3 (3 lecture and 0 laboratory hours / week)
Level/Term: 2nd level / Spring
Prerequisties: ENGC228 Eng. Mathematics I

Course Description:	
Definition of differential equations + Classification of differential equations (ordinary and partial, order,degree, linear and non-linear) + Solutions of differential equation (general and particular solution) + Formation of differential equation,First Order Ordinary Differential Equations - Separable Equations + Linear Equations	
Refernces:	
1- Thomas G.B., Weir, Hass, Giordano. Thomas's calculus(13th) 2- DIFFERENTIAL EQUATIONS with Boundary-Value Problemsa Zill Cullen	
Course Details:	
Subject	**Week**
Definition of differential equations + Classification of differential equations (ordinary and partial, order,degree, linear and non-linear) + Solutions of differential equation (general and particular solution)	1
First Order Ordinary Differential Equations - Separable Equations + Linear Equations	2
Homogeneous Equations + Exact Equation and Integrating Factor	3
Non-Linear First Order Ordinary Differential Equations + Application of First Order Ordinary Differential Equations-Newton's Law of Cooling	4
Application of First Order Ordinary Differential Equations- Heating + Falling Bodies	5
Second Order Ordinary Differential Equations - Linear Second Order Ordinary Differential Equation Linear, Constant Coefficients, Non- homogeneous Second Order Ordinary Differential Equation	6
Second Order Ordinary Differential Equations - Variable of Parameter Method	7
Undetermind Coefficients Method	8
Second Order Ordinary Differential Equations with Variable Coefficients	9
Application of Second Order Ordinary Differential Equations –	10
Introduction to Laplace Tranformation + Laplace Transfomation of some Functions +Laplace Tranform	11
Lplace InverseTransformation + First Shifting Theorem(Translation in s- domain) + Second Shifting	12
Laplace Transform of Unit Step Function + Convolution Theorem	13
Solution of Differential Equation by Laplace and Applications.	14-15

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Engineering MechanicsII DYNAMICS
Course Number/Type: ME 206 / Core
Credit Hours: 3 (3 lecture and 0 labortory hours / week)
Level/Term: 2nd level / Autumn
Prerequisties: MEC101 Statics II

Course Description:

The object of this class is to develop the students' abilities in understanding and solving dynamic problems related particles and rigid bodies. After successful completion this class, the students shall be able to analyze problems of:
Kinematics of Particles, Kinetics of Particles, Kinematics of Rigid Bodies, Kinetics of Rigid Bodies

Refernces:

Text Book: Engineering Mechanics "Dynamics" / J.L. Meriam and L.D. Kraige 5th ed. / References: Engineering Mechanics 'Dynamics" R. C. Hibbeler / Engineering Mechanics Dynamics / Andrew Pyel and Jan Kiwsalaas

Course Details:

Subject	Week
Kinematics of Particles: Introduction	1
Rectilinear Motion	2
Plane Curvilinear Motion, Rectangular Coordinates	3
Plane Curvilinear Motion, Normal and Tangential Coordinates	4
Plane Curvilinear Motion, Polar coordinates	5
Relative Motion (Translating Axes)	6
Kinetics of Particles; Force, Mass, and Acceleration	7
Work and Energy, Kinetic energy	8
Work and Energy, Potential energy	9
Impulse and Momentum, Linear	10
Impulse and Momentum, Angular.	11
Kinematics of Rigid Bodies: Rotation	12
Relative Velocity	13
Kinetics of Rigid Bodies: Introduction	14
Appendix A Mass Moment of Inertia.	15

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Fluid mechanics I
Course Number/Type: MEC203 /Core
Credit Hours: 3 (3 lecture and 0 labortory hours / week)
Level/Term: 2nd level / Autumn
Prerequisties:

Course Description:	
This is an introductory course on fluid motion, the forces that fluids exert, and the forces that are exerted on them. The study of fluid mechanics has numerous engineering applications. Fluids interact with structures such as high-rise buildings, dams, and bridges and the static and dynamic loads imposed by the fluids must be considered in the design and construction of these structures. Cars, aircraft, and ships all move through fluids	
Refernces:	
1- Elementary Fluid Mechanics Vennard and Street. 6thedition, 1982….. 2- Fluid Mechanics 5th edition Frank M. White. 1999.	
Course Details:	
Subject	**Week**
Introduction to fluid mechanics – basic concepts and applications (Units, density, compressibility,	1
Elasticity, viscosity, surface tension, capillarity, vapor pressure)	2
Elasticity, viscosity, surface tension, capillarity, vapor pressure)	3
Pressure applications and measurements.	4
Forces on immersed bodies and surfaces. Gates	5
Forces on immersed bodies and surfaces. Inclined gates	6
Forces on immersed bodies and surfaces. Curved gates	7
Fluid subjected to linear acceleration.	8
Introduction to fluid motion – basic concepts.	9
Conservation of mass, continuity equation.	10
Conservation of mass, continuity equation.	11
Equations of motions- Euler’s, Bernoulli’s and their applications.	12
Equations of motions- Euler’s, Bernoulli’s and their applications	13
work-energy equations for the flow of ideal fluid	14
work-energy equations for the flow of ideal fluid	15

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Fluid mechanics II
Course Number/Type: MEC253 / Core
Credit Hours: 2 (2 lecture and 0 labortory hours / week)
Level/Term: 2nd level / Spring
Prerequisties: MEC 203 Fluid mechanics I

Course Description:

Fluid flows are important in many scientific and technological problems including atmospheric and oceanic circulation, energy production by chemical or nuclear combustion in engines and stars, energy utilisation in vehicles, buildings and industrial processes, and biological processes such as the flow of blood. Considerable progress has been made in the mathematical modelling of fluid flows and this has greatly improved our understanding of these problems, but there is still much to discover. This course introduces students to the mathematical description of fluid flows and the solution of some important flow problems.

Refernces:

1- Elementary Fluid Mechanics Vennard and Street. 6thedition, 1982…..
2- Fluid Mechanics 5th edition Frank M. White. 1999.

Course Details:

Subject	**Week**
Impulse - Momentum principles and applications, Pipefittings, propellers, and impulse turbines.	1-2
Similitude	3-4
Dimensional analysis	5-6
Dimensional analysis	7
Friction losses in pipes	8
Friction losses in pipes	9
Friction losses in pipes	10
Flow of real fluids – basic concepts	11
External, internal flow	12
Laminar and turbulent flow	13
Definition of boundary layer	14
Laminar flow in pipe	15

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Mechanical Engineering Laboratory I
Course Number/Type: MEC256/Core
Credit Hours: 1 (0 lecture and 3 laboratory hours/week)
Level/Term: 2nd level / Spring
Prerequisities:

Course Description:

Students are highly encouraged to maintain a separate lab notebook for recording any observations, results, or comments while performing the experiments. You will also find it helpful to carry a USB drive to download data, or a camera to record images. To ensure that there are no injuries or accidents, lab safety training is mandatory. Lab attire includes close-toed shoes; no shorts or loose clothing / hair.

Refernces:

1- Data sheets for the experiments. (Can be downloaded from the Course web page)

Course Details:

Subject	**Week**
Bernoulli Equation Experiment	1
Bernoulli Equation Experiment	2
Rockwell Hardness Experiment	3
Rockwell Hardness Experiment	4
Tensile Test Experiment	5
Tensile Test Experiment	6
Moment of Inertia of Flywheel Experiment	7
Moment of Inertia of Flywheel Experiment	8
Adiabatic Index of Air Experiment	9
Adiabatic Index of Air Experiment	10
Rope-belt Friction Experiment	11
Rope-belt Friction Experiment	12
Engine Model Experiment	13
Engine Model Experiment	14
Universal Beam Experiment	15

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Mechanical drawing
Course Number/Type: MEC204/Core
Credit Hours: 1 (0 lecture and 3 laboratory hours/week)
Level/Term: 2nd level / Autumn
Prerequisties: ENGC124 Auto-CAD

Course Description:

This is a beginning drawing course. Students are introduced to fundamental knowledge and skills such as line work, lettering, scale use, and sketching, multi-view drawings, sectional views, with the basics of manual drafting techniques and the use of drafting equipment.

Refernces:

1- MECHANICAL DRAWING**.**

Course Details:

Subject	**Week**
Introduction	1
Fastener (Bolts and nuts)	2
Fastener (Welding)	3
Assembly (Coupling)	4
Assembly (Coupling)	5
Assembly (Coupling)	6
Assembly (Pipe Joint)	7
Mid. Term exam	8
Assembly (Bearings)	9
Assembly (Bearings)	10
Assembly (Element of machine part)	11
Assembly (Element of machine part)	12
Assembly (Element of machine part)	13
Tolerances and Fits	14
Final Examnation	15

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Mechanics of Materials I
Course Number/Type: MEC 202 / Core
Credit Hours: 3 (3 lecture and 0 laboratory hours /week)
Level/Term: 2st level / Autumn
Prerequisties: ENGE133 Physics

Course Description:

The study of mechanics of materials is the study of the behaviour of solid bodies under load. The way in which they react to applied forces, the deflections resulting and the stresses and strains set up within the bodies are all considered in an attempt to provide sufficient knowledge to enable any component to be designed such that it will not fail within its service life. Typical components considered in detail in this volume include beams, shafts, cylinders, struts, diaphragms and springs and, in most simple loading cases

Refernces:

E. J. Hearn. "Mechanics of Materials 1: (Strength of Materials), An Introduction to elastic and plastic deformation of solids and structural materials ", 3rd edition or any new edition. (Can be downloaded from the Course web page). / R. C. Hibbeler. "Strength of Materials". 12th edition or any new edition 2012. (Can be downloaded from the Course web page).

Course Details:

Subject	Week
Introduction; syllabus; Classification of engineering mechanics; Definition of mechanics of materials; Why do we study mechanics of materials; classification of materials properties; Mechanical properties of the materials; Tensile test; Hardness; Impact test;	1
Introduction; Normal (Direct) stress; Direct strain; Sign convention for direct stress and strain; Bearing stress; Elastic materials Hook's law); Modulus of elasticity (Young Modulus); Tensile test; Ductile and Brittle materials; Poisson's ratio; Application of Poisson's ratio to a two dimensional stress system; Shear stress and shear strain; Allowable Working Stress – Factor of Safety; Temperature stress. Problems.	2-3
Introduction; Statically determinate and statically indeterminate systems; Compound bar subjected to external load; Equivalent or combined modulus; Compound bar subjected to temperature change; Problems.	4-5
Introduction; What is a beam; Beam types; Shear force and bending moment definitions; shear force and bending moment sign conventions; Types of loading beams; S.F. and B.M. diagrams for beams carrying concentrated loads only; S.F. and B.M. diagrams for uniformly distributed loads (u.d.l.); S.F. and B.M. diagrams for combined concentrated and uniformly distributed loads (u.d.l.); Point of Contraflexure; Relationship between S.F. and B.M. and intensity of loading; S.F. and B.M. diagrams for an applied couple or moment; S.F. and B.M.	6-7
Introduction; Simple bending theory; Neutral axis; Section modulus; Second moment of area; Combined bending and direct stress ; Shear stresses owing to bending; Limitations of the simple bending theory; Problems.	8-9
Introduction; Distribution of shear stress due to bending; Application to rectangular sections; Application to I-section beams; Vertical shear in the web; Vertical shear in the flanges; Horizontal shear in the flanges; Application to circular sections; Limitation of shear stress	10-11
Introduction; Simple torsion theory; ; Polar second moment of area; Shear stress and shear strain in shafts; Section modulus; Torsional rigidity; Torsion of hollow shafts; Torsion of thin-walled tubes; Composite shafts -series connection; Composite shafts -parallel connection; Power transmitted by shafts; Problems.	12-13
Check the solution of student tutorial sheet, Report required from students.	14-15

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Mechanics of Materials II
Course Number/Type: MEC252/ Core
Credit Hours: 2 (2 lecture 0 laboratory hours /week)
Level/Term: 2nd level / Spring
Prerequisites: MEC202 Mechanics of Materials I

Course Description:

The study of mechanics of materials is the study of the behavior of solid bodies under load. The way in which they react to applied forces, the deflections resulting and the stresses and strains set up within the bodies are all considered in an attempt to provide sufficient knowledge to enable any component to be designed such that it will not fail within its service life. Typical components considered in detail in this volume include beams, shafts, cylinders, struts, diaphragms and springs and, in most simple loading cases,

Refernces:

1- E. J. Hearn. "Mechanics of Materials 1: (Strength of Materials), An Introduction to elastic and plastic deformation of solids and structural materials ", 3rd edition or any new edition. (Can be downloaded from the Course web page).
2- R. C. Hibbeler. "Strength of Materials". 12th edition or any new edition 2012. (Can be downloaded from the Course web page).

Course Details:

Subject	Week
Slope and deflection of beams, Introduction; Direct integration method; Macaulay's method;	1
Macaulay's method for u.d.l; Macaulay's method for beams with u.d.1. applied over part of the beam;	2
Macaulay's method for couple applied at a point; Mohr's "area-moment" method;	3
Principle of superposition; Energy method; Relationship between loading, S.F., B.M., slope and deflection; Problems	4
Thin Cylinders and Shells. Introduction; Thin cylinders under internal pressure; Hoop or circumferential stress; Longitudinal stress;	5
Changes in dimensions; Thin rotating ring or cylinder; Thin spherical shell under internal pressure; Change in internal volume;	6
Vessels subjected to fluid pressure; Cylindrical vessel with hemispherical end; Effects of end plates and joints; Problems	7
Complex Stresses. Introduction; Stresses on oblique planes; Material subjected to pure shear;	8
Material subjected to two mutually perpendicular direct stresses;	9
Material subjected to combined direct and shear stresses; Principal plane inclination in terms of the associated principal stress;	10
Graphical solution - Mohr 's stress circle. Problems.	11
Complex Strain and the Elastic Strain, Introduction; Application of Mohr's circle to combined loadings,	12
Mohr's circle for strains, columns,	13
Solving Problems	14
Strain Energy. Introduction to strain energy	15

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Non-Destructive Testing
Course Number/Type: MEC261/ Core
Credit Hours: 1 (1 lecture 0 laboratory hours /week)
Level/Term: 2nd level / Spring
Prerequisties: MEC152 Metallurgy Physics I

Course Description:

The main objective of the course is to provide students principles of the types, advantages and applications of various NDT methods to be able to choose the best NDT method for a given part in the industry.

Refernces:

1- Engineering metallurgy,R.A.Higgins,2002,London.
2- Nondestructive Testing Methods and New Applications, Mohammed Omar,Intech publisher,Croatia,2012.
3- Guidebook for the Fabrication of Non-Destructive Testing (NDT) test specimens,International Atomic Energy Agency, 2001,Austria.
4- NDT Guidance document:An introduction to common NDT methods,The British institute for non destructive testing,England,2015.

Course Details:

Subject	Week
Introduction to NDT methods and its application in the industry.	1
Visual testing method.	2
Liquid penetrating testing method	3
Magnetic particles testing method	4
Eddy current testing method	5
Introduction to radiographic testing methods(x ray and gamma ray)	6
X ray testing method	7
Gamma ray testing method	8
Ultrasonic testing method:theory and principles	9
Ultrasonic testing method:types of ultrasonic testing	10
Ultrasonic testing method:Applications in metals	11
Other NDT testing methods	12
Types and classification of defects in metals	13
Weld defecs and discontinuity	14
Applications of non destructive methods on metals	15

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Physics for Engineers
Course Number/Type: MEC205/Core
Credit Hours: 3 (3 lecture and 0 laboratory hours /week)
Level/Term: 2nd level / Autumn
Prerequisties: ENGE133 Physics

Course Description:

Mechanics is a branch of the physical sciences that is concerned with the state of rest or motion of bodies subjected to the action of forces.Fundamental Science Concerned with the fundamental principles of the Universe Foundation of other physical sciences Has simplicity of fundamental concepts Divided into six major areas Classical Mechanics,Relativity ,Thermodynamics,Electromagnetism,Optics,Quantum Mechanics

Refernces:

1- Fundamentals of Physics. David Halliday, Robert Resnick and Jearl Walker.10th edition, 2014.
2- Engineering Mechanics: Dynamics - Volume 2. J.L. Meriam, L.G. Kraige and J. N. Bolton. 8th edition, 2015.

Course Details:

Subject	**Week**
Introduction to Physics , Classical Physics Overview , Modern Physics, Special Relativity	1
Quantum Mechanics, Measuremen, Quantities Used in Mechanics	2
Model Building, Modeling Technique	3
Basic Quantities and Their Dimension , Dimensional Analysis	4
Motion in One Dimension, Kinematics, Types of Motion, Position, Position-Time Graph	5
Vectors and Scalars, Average Velocity, Average Speed, Instantaneous Velocity, Analysis Models	6
Coordinate Systems, Cartesian Coordinate System, Polar Coordinate System, Cartesian to Polar Coordinates	7
Motion in Two Dimensions, Average and Instantaneous Velocity, Average and Instantaneous Acceleration	8
Kinematic Equations for Two-Dimensional Motion,Kinematic Equations, Graphical Representation	9
The Laws of Motion,Newton's 1st ,2ed and 3ed laws	10
Circular Motion and Other Applications of Newton's Laws	11
Energy of a System	12
Work Done by a Varying Force,Hooke's Law	13
Kinetic Energy	14
Work-Kinetic Energy Theorem	15

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Statistics
Course Number/Type: ENGC227 / Core
Credit Hours: 2 (2 lecture and 0 laboratory hours /week)
Level/Term: 2nd level / Spring
Prerequisties:

Course Description:	
The main objective of this course is to provide students the principles of statistics and statistical analysis mostly used in applications in the engineering and science.	
Refernces:	
1-"Elementary statistics",Ron Larson,5th edition,Prentic Hall,Boston,2012.(Text book). 2-"Introduction to statistics and data analysis",Roxy Peck,3rd edition,Thomson Brooks,2008,USA.	
Course Details:	
Subject	**Week**
Introduction to engineering statistics,types of statistics(descriptive and inferential),Basic terms in statistics (data,population and sample).	1
Frequency distribution table (creating,graphical representation),types of graphs(histogram,polygon and ogive).	2
Measures of central tendency (Arithmetic mean, median and mode, Measures of dispersion and variation (range, mean deviation, variance, standard deviation, Coefficient of variation and standardize scores).	3
Basic concepts of probability theory (random events and sample space), Sets and probabilistic models, axioms of probability.	4
Rules of probability,addition and multiplication rule,two events and three events(mutually and non mutually events).	5
Conditional probability ,Bayes theorem.	6
Permutation and combination,Tree diagram probability.	7
Definition and classification of random variable(continuous and discrete),types of discrete distribution.	8
Discrete probability distribution(Binomial and Poisson distribution).	9
Continous probability distribution:normal distribution, properties of normal distribution,Area under the curve of normal distribution.	10
Continous probability distribution:Transformation from normal distribution to standard normal distribution,relation between binomial and normal distribution.	11
Test of hypothesis, Types of errors in hypothesis testing,The steps of hypothesis test.	12
Hypothesis test of the mean with unknown population variance.	13
Hypothesis test of two means with known population variance.	14
The principles design of experiments,one and two way ANOVA.	15

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Thermodynamics I
Course Number/Type: MEC201/Core
Credit Hours: 3 (3 lecture and and 0 laboratory hours/week)
Level/Term: 2nd level / Autumn
Prerequisties: ENGE133 Physics

Course Description:

his course provides a non-calculus overview of applied thermodynamics. Topics include: pressure; temperature; heat and heat transfer; properties of substances; First Law of Thermodynamics and its application; Second Law of Thermodynamics and its application; analysis of power and refrigeration cycles.

Refernces:

1- Thermodynamics; An Engineering Approach, Y. Cengel, M. Boles, M. Kanoglu. (Textbook).
2- Fundamentals of Engineering Thermodynamics, Michael J. Moran, Howard N. Shapiro .

Course Details:

Subject	**Week**
Introduction, concept, and definitions.	1
Introduction, concept, and definitions.	2
Energy, heat, work, first law of thermodynamics.	3
Energy, heat, work, first law of thermodynamics.	4
Energy, heat, work, first law of thermodynamics.	5
Properties of Pure Substances,	6
Properties of Pure Substances,	7
Energy analysis of a closed system.	8
Energy analysis of a closed system.	9
Energy analysis of a closed system.	10
Mass and energy analysis of control volumes	11
Mass and energy analysis of control volumes	12
The second law of thermodynamics	13
The second law of thermodynamics	14
The second law of thermodynamics	15

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Thermodynamics II
Course Number/Type: MEC251/Core
Credit Hours: 3 (3 lecture and 0 laboratory hours /week)
Level/Term: 2nd level / Spring
Prerequisties: MEC201 Thermodynamics I

Course Description:

this course provides a non-calculus overview of applied thermodynamics. Topics include: pressure; temperature; heat and heat transfer; properties of substances; First Law of Thermodynamics and its application; Second Law of Thermodynamics and its application; analysis of power and refrigeration cycles.

Refernces:

1- Thermodynamics; An Engineering Approach, Y. Cengel, M. Boles, M. Kanoglu. (Textbook)**.**
2- Fundamentals of Engineering Thermodynamics, Michael J. Moran, Howard N. Shapiro **.**

Course Details:

Subject	**Week**
Entropy	1
Entropy	2
Entropy	3
Exergy analysis	4
Exergy analysis	5
Gas power cycles	6
Gas power cycles	7
Vapor and Combined Power cycles	8
Vapor and Combined Power cycles	9
Vapor and Combined Power cycles	10
Refrigeration Cycles	11
Refrigeration Cycles	12
Thermodynamic Property relations	13
Thermodynamic Property relations	14
Thermodynamic Property relations	15

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Design of Machine Elements
Course Number/Type: ME 314

Credit Hours: 4 (3 lecture and 0 laboratory hours/week)
Level/Term: 3rd level / Spring
Prerequisties:

Course Description:

- Design of Machine Elements is a required course for mechanical engineering students.
- This course is an introduction to the basic principles of modern engineering.
- It provides the students with fundamental skills of engineering and the ability to apply the theories of science to practice and understand the factors; such as stresses, deformations, and failure criteria, influencing the machine elements like shafts, springs, belts, bearings, gears etc.
- The main objective of design of machine element is that the machine should function properly to satisfy the needs of the customer and it should be safe against the predicted modes of failure.

Refernces:

1- **Machine Element in Mechanical Design by Mott**

2- **Design of Machine Elements by V. B. Bhandari**

3- **Mechanical Engineering Design by Shigley's**

Course Details:

Subject	Week
Introduction to Design of Machine Elements	1
Mechanical properties and materials	2
Mechanical properties and materials	3
Stress analysis	4
Stress analysis	5
Combined stress and Mohr′s circle	6
Combined stress and Mohr′s circle	7
Design for Different Type of Loading	8
Design for Different Type of Loading	9
Columns	10

Columns	11
Design of belts	12
Design of belts	13
1st Term Examination	14 & 15
Design of Chains	16
Design of Chains	**17**
Design of Keys and Coupling	18
Design of shafts	19
Design of shafts	20
ASME CODE	21
Design and selection of bearings	22
Design and selection of bearings	23
Design and selection of bearings	24
2nd Term Examination	25 & 26
Design of bolts and nuts	27
Design of bolts and nuts	28
Final Examination	29 & 30

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Engineering and Numerical Analysis
Course Number/Type: ME 301/Full
Credit Hours: (3-1-1)7
Level/Term: 3rd Year/First and Second terms
Prerequisties: Mathematics I and II courses as well as the programming language course.

Course Description:

The subject covers different analytical topics (Laplace transformation, Fourier series, special functions, PDE's, Complex number).The Numerical topics covers (solution of equation by iteration, Solution of system of linear equations, Numerical integration, Numerical Differentiation, Solution of first order ODE). The objective of the course is study of advanced methods in mathematics for solution of engineering problems, also studying of some numerical methods.

References:

1- Erwin Kreyszig , "Advanced Engineering Mathematics", Sixth Edition, John Wiley & Sons, 1988.
2- C. ray Wylie and Louis C. Barrett, "Advanced Engineering Mathematics ", Fifth Edition, International Student Edition, McGraw-Hill Book Company,1985.
3- Steven C. Chapra and Raymound P. Canale, " Numerical Methods For Engineers", Second Edition, McGraw-Hill Company, 1989.

Course Details: First Term

Subject	**Week**
1- Engineering Analysis (Laplace Transformation) (Syllabus, Laplace Transform, Inverse Transform, Linearity) **2-** Numerical Analysis (Introduction) (Introduction, Error, Source of Errors)	1
1- Engineering Analysis (Laplace Transformation) (Laplace Transform of Derivatives and Integrals) **2-** Numerical Analysis (Solution of Equation by Iteration) (Fixed-Point Method, Newton's Method)	2
1- Engineering Analysis (Laplace Transformation) (Shifting on the s-axis, Differentiation of Transforms) **2-** Numerical Analysis (Solution of Equation by Iteration) (Secant Method, Bisection Method, False Position Method)	3
1- Engineering Analysis (Laplace Transformation) (Convolution(Integral Equations), Partial fractions)	4

2- Numerical Analysis (Laboratory Experiment Assignment) (Apply Computer Programs for Solution of Equation by Iteration)	
1- Engineering Analysis (Laplace Transformation) (System of Differential Equations, Periodic Functions) **2-** Numerical Analysis (Laboratory Experiment Assignment) (Apply Computer Programs for Solution of Equation by Iteration)	5
1- Engineering Analysis (Fourier Series) (Periodic Functions, Trigonometric Series) **2-** Numerical Analysis (Laboratory Experiment Assignment) (Apply Computer Programs for Solution of Equation by Iteration)	6
1- Engineering Analysis (Fourier Series) (Fourier Series) **2-** Numerical Analysis (Solution of System of Linear Equations) (Direct Methods (Gauss Elimination))	7
1- Engineering Analysis (Fourier Series) (Functions of Any Period P=2L) **2-** Numerical Analysis (Solution of System of Linear Equations) (Indirect or Iterative Methods(Jacobi Method))	8
1- Engineering Analysis (Fourier Series) (Even and Odd Functions) **2-** Numerical Analysis (Solution of System of Linear Equations) (Indirect or Iterative Methods(Gauss-Seidel Method))	9
1- Engineering Analysis (Fourier Series) (Half-Range Expansions) **2-** Numerical Analysis (Laboratory Experiment Assignment) (Programming the Different Methods for Solution of System of Linear Equations)	10
1- Engineering Analysis (Special Functions) (Gamma Function) **2-** Numerical Analysis (Laboratory Experiment Assignment) (Programming the Different Methods for Solution of System of Linear Equations)	11
Engineering Analysis (Special Functions) (Beta Function)	12
Numerical Analysis (Laboratory Experiment Assignment) (Programming the Different Methods for Solution of System of Linear equations)	13
Review (Engineering Analysis)	14
Review(Numerical Analysis)	15

Course Details: Second Term	
Subject	**Week**
1- Engineering Analysis (Partial Differential Equations) (Basic Concepts) **2-** Numerical Analysis (Numerical Integration) (Rectangular rule, Trapezoidal rule)	1
1- Engineering Analysis (Partial Differential Equations) (Modeling: Vibrating String. One-Dimensional Wave Equation) **2-** Numerical Analysis (Numerical Integration) (The Multiple-Application Trapezoidal Rule, Simpson's 1/3 Rule)	2
1- Engineering Analysis (Partial Differential Equations) (Method of Separating Variables (Product Method)) **2-** Numerical Analysis (Numerical Integration) (The Multiple-Application Simpson's 1/3 Rule, Simpson's 3/8 Rule)	3
1- Engineering Analysis (Partial Differential Equations) (Method of Separating Variables (Product Method)) **2-** Numerical Analysis (Laboratory Experiment Assignment) (Computer Programs for Numerical Integration)	4
1- Engineering Analysis (Partial Differential Equations) (Heat Flow) **2-** Numerical Analysis (Laboratory Experiment Assignment) (Computer Programs for Numerical Integration)	5
1- Engineering Analysis (Partial Differential Equations) (Heat Flow) **2-** Numerical Analysis (Numerical Differentiation) (Taylor Series)	6
1- Engineering Analysis (Partial Differential Equations) (Laplace Equation) **2-** Numerical Analysis (Numerical Differentiation) (Forward-Backward-Central Difference Approximation of The First and Higher Derivatives)	7
1- Engineering Analysis (Complex Numbers) (Definition, Representation in the Polar Form, Complex Plane, Arithmetic Operations, Properties of the Arithmetic Operations, Complex Conjugate Numbers) **2-** Numerical Analysis (Laboratory Experiment Assignment) (Programming The Different Methods of Numerical Differentiation)	8
1- Engineering Analysis (Complex Numbers)	9

(Polar Form of Complex Numbers, Powers and Roots) **2-** Numerical Analysis (Laboratory Experiment Assignment) (Programming The Different Methods of Numerical Differentiation)	
1- Engineering Analysis (Complex Numbers) (Polar Form of Complex Numbers, Powers and Roots) **2-** Numerical Analysis(Methods for First-Order Differential Equations) (Euler Method, Improved Euler Method)	10
1- Engineering Analysis (Complex Numbers) (Curves and Regions in the Complex Plane) **2-** Numerical Analysis(Methods for First-Order Differential Equations) (Runge-Kutta Method)	11
1- Engineering Analysis (Complex Numbers) (Curves and Regions in the Complex Plane) **2-** Numerical Analysis(Laboratory Experiment Assignment) (Programming the Methods for Solution of First-Order Differential Equations)	12
1- Engineering Analysis (Complex Numbers) (Limit, Derivative, Analytic Function) **2-** Numerical Analysis(Laboratory Experiment Assignment) (Programming the Methods for Solution of First-Order Differential Equations)	13
Review (Engineering Analysis)	14
Review(Numerical Analysis)	15

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Fluid Mechanics 2/ Turbomachines
Course Number/Type: ME315
Credit Hours: 2 (2 lecture and 0 laboratory hours/week)
Level/Term: 3rd level
Prerequisties: Fluid Mechanic

Course Description:

Topics include the energy transfer and velocity diagram in turbomachines, practical method for design and performance predict of turbomachines (pump, hydraulic turbine, wind turbine, fan, blower, compressor….).

After completing the course the student will be able to:

- Give examples of the main applications of turbomachines
- Recognize typical designs of turbomachines
- Explain the working principles of turbomachines and apply it to various types of machines
- Determine the velocity triangles in turbomachinery stages operating at design and off- design conditions.
- Match a pump to a system and discuss various solutions of pump matching from a sustainability point-of-view
- Explain the working principle of various types of hydro turbines and know their application range
- Use design parameters for characterizing turbomachinery stages
- Determine the off-design behavior of turbines and compressors and relate it to changes in the velocity triangles
- Explain and understand how the flow varies downstream of a turbomachinery blade row
- Recognize relations between choices made early in the turbomachinery design process and the final components and operability.
- Explain the limits of safe operation of compressors .

Refernces:

1- Turbo Machines by Valan Arasu.
2- A Textbook of Fluid Mechanics and Hydraulic Machines by Bansal and, R.K.

Course Details:

Subject	**Week**
Fluid Machines: Positive Displacement Machines and Turbomachines. Turbomachines Definition, types and Parts. Classification of turbomachines: Based on energy transfer, Base d on fluid following in turbo machine, Based on direction of flow through the impeller or vanes or blades, Based on condition of 1luid in turbo machine, Based on position of rotating shaft.	1
Hydraulic pump, Pump definition, Types of pumps, Centrifugal pump definition, Main parts of a centrifugal pump, casing of centrifugal types, centrifugal pump Principle of operation, Classification of centrifugal pumps,	2

Advantages of centrifugal pumps, Problems of centrifugal pumps.	
Inlet and outlet triangle of velocities, triangle velocities Analysis.	3
Solving problems for centrifugal pumps	4
Head of Pump: Euler head, Static head, Suction head, Delivery head, Manometric Head. Losses in centrifugal pump: Hydraulic losses, Mechanical losses, Leakage loss. Efficiencies: Manometric or hydraulic efficiency, Volumetric efficiency, Mechanical efficiency, Overall efficiency.	5
Solving problems for centrifugal pumps	6
Pump Minimum starting speed, Specific speed, Net positive suction head, Cavitation in centrifugal pumps, Multi-Stage centrifugal pumps: Pumps in series, Pumps in parallel. Model Testing and Geometrically Similar Pumps. Characteristic curve of centrifugal pumps: Main Characteristic curve, operating Characteristic curve, Constant efficiency curve.	7
Solving problems for centrifugal pumps	8
Characteristic curve of centrifugal pumps: Main Characteristic curve, operating Characteristic curve, Constant efficiency curve	9
Exam (Pumps)	10
Hydraulic Turbine Definition, Classification of Hydraulic Turbine: According to the type of energy at the inlet, According to the direction of flow through the runner, According to the head at the inlet of turbine, According to the specific speed of the turbine. Impulse turbine, Pelton Wheel. Parts of Pelton turbine. Velocity triangles and work done for Pelton wheel. Power. Velocity Coefficient. Velocity ratio. Efficiencies: Overall efficiency, Hydraulic efficiency, Nozzle efficiency. Number of Buckets. Width of Buckets. Depth of Buckets. Important term: Penstocks, Head race, Tail race. Heads: Gross or total head, Net or effective head.	11
Solving problems for Pelton turbine	12
Reaction turbine, Classification of Reaction Turbine: Radial flow turbines, Axial flow turbine, Mixed flow turbines.	13
Francis Turbines. Main Components of Francis Turbines. Velocity triangles and work done for Francis Turbine. Net Head Across Reaction Turbine. Efficiencies: Overall efficiency, Hydraulic efficiency. Flow ratio. Speed ratio. Ratio of width to diameter.	14
Solving problems for Francis Turbines	15
Axial flow reaction turbine: Propeller turbine, and Kaplan Turbine. Main parts of a Kaplan turbine. Velocity triangles and work done. Discharge through a Kaplan turbine. Net Head Across Kaplan Turbine.	16
Efficiencies: Overall efficiency, Hydraulic efficiency. Flow ratio, Speed ratio, Specific speed.	17
Solving problems for Kaplan turbine.	18
Draft Tube. Types of Draft tubes. Draft tube theory. Efficiency of Draft tube.	19
Solving problems for Draft tube.	20
Governing of Hydraulic Turbine. Governing system for Pelton turbine. Reaction turbine governor system. Turbine	21

cavitation.	
Fundamentals of wind energy. Wind power. Blade swept area. Air density. Wind power density. Wind speed. Wind direction. Modern wind turbines. Wind turbine classification. Wind turbine capacity. Wind turbine configuration.	22
Wind power parameters. Power curve. Wind turbine capacity factor.	23
Solving problems for Wind turbine.	24
Exam (Turbines).	25
Fans, and Blower. General outlines about Fans. Difference Between Fans and Blower. Compounds of Fan and Blower. Fan Types. Centrifugal Fans.	26
Solving problems for Fans, and Blower.	27
Compressors. General outlines about Compressors. Compounds of Compressors. Compressors Types. Centrifugal Compressors.	28
Solving problems for Compressors.	29
Exam (Fan & Compressors)	30

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Heat Transfer
Course Number/Type: MEC302
Credit Hours: 3 (2 lecture and 0 laboratory hours/week)
Level/Term: 3rd level
Prerequisties:

Course Description:	
Fundamental principles and theory of heat transfer by conduction, convection, and radiation. Design aspects of hear transfer are introduced through the assignments of open-ended problems and design projects. State-of-the art software programs are introduced to solve the design problems and projects. Engineering applications and techniques, such as hear transfer from extended surfaces, and designs of heat exchangers.	
Refernces:	
1- Heat Transfer(10th edition) J.P. Holman 2010. 2- Fundamentals of Heat and Mass Transfer Frank P. Incropera & David P. Dewitt 2001 .	
Course Details:	
Subject	**Week**
Modes of heat transfer	1
One dimensional conduction heat transfer	2
Heat transfer from fins	3
Thermal contact resistance	4
Unsteady state resistance	5
Two dimensional heat transfer	6
Forced convection heat transfer	7
Forced convection heat transfer from flat plates (laminar and turbulent)	8
Heat transfer for laminar and turbulent fluid flow in pipes	9
Heat transfer for laminar and turbulent fluid flow in pipes	10
Heat transfer for laminar and turbulent fluid flow in pipes	11
Natural convection heat transfer	12
Natural convection heat transfer	13
Natural convection heat transfer from vertical surface	14

Natural convection heat transfer from vertical surface	15
Natural convection heat transfer from horizontal cylinder	16
Natural convection heat transfer from horizontal cylinder	17
Heat exchangers	18
Heat exchangers	19
Logarithmic mean temperature difference	20
Logarithmic mean temperature difference	21
NTU method	22
NTU method	23
Radiation properties	24
Radiation shape factor	25
Radiation shape factor	26
Radiation heat transfer between surfaces	27
Radiation heat transfer between surfaces	28
Radiation shields	29
Radiation shields	30

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Industrial Management
Course Number/Type: ENME 307
Credit Hours: 2 hours/week)
Level/Term: Class:3rd

Prerequisites: manufacturing process , Programming ,Statistical principles,

Course Description:

تهدف الادارة الصناعية إلى تخطيط وتنظيم وتوجيه ورقابة جهود الأفراد داخل المشروع الصناعي او الخدمي للوصول إلى الأهداف المقررة، عن طريق الاستخدام الأمثل لعناصر الإنتاج (المتمثلة في المواد الخام، الآلات، الأيدي العاملة، رأس المال) بأقل التكاليف وبأفضل الإمكانات والوسائل المتاحة ,عليه فأن مقرر المادة الدراسة يشمل المواضيع التي تعزز الحالة المعرفية للطالب وترفده بالمعلومات الاساسية اللازمة والتي تخص هذا الجانب المعرفي المهم لجميع المهندسين عامة و مهندسي الميكانيك بشكل خاص.
: تتضمن مواد المقرر الاتي
التعاريف والمصطلحات والمفاهيم الاساسية للادارة الصناعية والتي تمثل مدخلاً ضروريا للمواضيع اللاحقة. ومن المواضيع المهمة موضوع الادارة العامة الذي يشمل مفهموم الادارة والمدير بوصفه العنصر الفعال في اي منظمة سواء كانت انتاجية او خدمية، كما سيتعرف الطالب على المستويات الادارية وانواع الهياكل التنظيمية في المنظمة , كما يشمل المقرر موضوع أدارة الانتاج والعمليات الذي يختص بعناصر النظام الانتاجي وقياس الانتاجية في اي منظمة وقياس الكفاءة والفعالية , ويدرس الطالب كذلك اسلوب تحليل نقطة التعادل جبرياً وبيانيا لحساب كمية الانتاج التي تحدد مناطق الربح والخسارة.
كما يتضمن المقرر دراسة اسلوب المخاطبات الادارية والتي يتعرف بها الطالب كيفية التعامل مع الكتب الرسمية والتقارير الادارية والفنية والامور التي يجب مراعاتها في الرسالة الادارية , كما يشمل المقرر دراسة التوصيف الوظيفي واهميته في ادارة أي منظمة ، ومن جانب اخر يدرس الطالب الاسلوب العلمي في انشاء المشروع الاستثماري و كيفية ادارته والمراحل التي يمر بها ودراسة الجدوى المبدئية والتفصيلية للمشروع ، ويتضمن المقرر دراسة نظم ادارة وضمان الجودة والتي يتعرف فيها الطالب على ماهية الجودة ومتطلبات تطبيق برامج الجودة الشاملة وادواتها و التعرف على مفهوم الايزو والتعرف على خرائط ضبط الجودة.
اما الموضوع الاخر ضمن المقرر فهو التخطيط الاستراتيجي ويشمل استراتيجية التخطيط للمنتج او الخدمة والأسبقيات التنافسية ، الموضوع الاخر هو السلامة الصناعية والصحة المهنية في المنشات الصناعية والخدمية التي تختص بمفهوم السلامة المهنية وحوداث العمل والمسؤلين عن تطبيق برامج السلامة المهنية والنتائج المترتبة عليها , كما يشمل المقرر اساليب اتخاذ القرارات في ادارة الاعمال , اما الموضوع الاخر يشمل ادارة الصيانة والتي تعد احد المتطلبات المهمة في اي منشاة صناعية او خدمية وتشمل مفهوم الصيانة واهدافها وتصنيفات الصيانة وكلف الصيانة والاستبدال والمفاضلة بين الصيانة الوقائية والعلاجية.عن

Refernces:

1- ترجمة د. فكتور يوسف توفيق **Introduction To Industrial Engineering, Richard C. Vaughn**
2 - ادارة الانتاج والعمليات,الطبعة الثالثة ,2009,أ د عبد الكريم محسن **Production and Operation Management**
3- ادارة الانتاج والعمليات مرتكزات معرفية وكمية , 2008 أ.د غسان قاسم اللامي
4- بحوث العمليات وتطبيقاتها , أ.د خالد جرجيس عبو , الجامعة التكنولوجية , بغداد 1987
5- كتاب مترجم **Management Mistakes And Successes . Robert F. Hartley , Cleveland University , 2000**
6- مواقع علمية رصينة على شبكة الانترنت
7- التخطيط الاستراتيجي ،عرض نظري وتطبيقي ، 2009، د.مجيد الكرخي

Course Details:	
Subject	**Week**
• Industrial management (Definitions ,Terms and concepts)	1
• Organization and organizational structures	2
• Organization and organizational structures 2	3
• levels and skills For Manager	4
• Functional description	5
• Administrative correspondences and technical reports,	6
• Administrative correspondences and technical reports,	7
• Production and operations management	8
• Production and operations management	9
• Productivity, types of productivity and Efficiency and Effectiveness	10
• Break- Even Analysis	11
• Strategic planning	12
• Strategic planning	13
• Competitive Priorities	14
• Quality Control	15
• Quality dimensions, Quality Cost	16
• International organization for standardization	17
• The seven basic tools of total quality management	18
• Data collection and analyzing , Histograms	19
• Check lists, Pareto ,s diagram	20
• Cause and effect diagram	21
• Scatter diagram , Control charts	22
• Economic and Technical feasibility	23
• Management of maintenance \ Maintenance concept, objectives and importance , Costs	24
• Maintenance classifications) Preventive and curative maintenance) and replacement	25
• Industrial safety and occupational healthy	26
• Industrial safety and occupational healthy	27

• Troubleshooting diagnoses	28
• Troubleshooting diagnoses	29
• 2nd term Examination	30

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Internal combustion engines
Course Number/Type: ME 513
Credit Hours: 3 (2 lecture and 1 Tetorial hours/week)
Leve l/ Term: 3 year
Prerequisties: Engineering Thermodynamics

Course Description:

An introduction to internal combustion engines , type of internal combustion engines, Mixture of ideal gases and properties , combustion definition and types (complete, incomplete and stoichiometric combustion), calculation of air-fuel ratio from combustion equations, exhaust gases (volumetric and gravimetric analysis , wet and dry analysis, 1st law of thermodynamic applied to combustion processes for calculation the amount heat released during combustion, adiabatic flame temperature calculation , second law of thermodynamic applied to combustion processes , dissociation and chemical equilibrium , air standard cycles, fuel-air cycle calculation , actual cycle, criteria performance of internal combustion engines (spark ignition and diesel engines) which involve determination of thermal efficiency , specific fuel consumption , mean effective pressure and power out, description of combustion phenomena in both spark ignition engine and compression ignition engines , gas turbine cycles , simple cycle and modified cycles, and calculation of performance, turbojet engine, turbofan , turbo propeller air craft engines and their performance. And finally exhaust emission from internal combustion engines, methods are used to reduce emission and after treatment method such as catalytic convertor .

Refernces:

1- Internal Combustion Engines, Colin,R.Ferguson, Allan T. Kirkpatrick , John wiley & Sonc,Inc. 2015
2- Engineering Fundamental of the Internal Combustion Engines, Willard Pulkrabek , **,** Prentice Hall. 1997
3- Internal Combustion Engines Fundamentals, John .B. Heywood , John wiley & Sonc,Inc 1989.

Course Details: Internal combustion engines

Subject	Week
Introduction to internal combustion engines	1
Mixture of ideal gases	2
Energy properties of ideal mixture such as U, H and S in addition to specific heats and molecular weight and other properties	3

Combustion, definition, types , calculation of air-fuel ratio , equivalence ratio	4
Exhaust gaseous analysis molar (volumetric) analysis, mass (gravimetric) analysis, wet and dry analysis	5
Application of the first law of thermodynamic to combustion process in closed and open systems , calculation of heat transfer due to combustion processes ,	6
enthalpy of combustion at 25 ^{O}C " ΔH^{o}", Internal energy of combustion at 25 ^{O}C , ΔU^{o}	7
Solving problems for estimating the heat released from combustion of hydrocarbon fuel	8
Calorific value of fuel, heating value(tabulated), Adiabatic flame temperature estimation	9
Short exams and tetorial	10
The second law of thermodynamic of thermodynamics applied to combustion processes	11
Dissociation , equilibrium constant ,gibbs function, entropy calculation	12
Tetorial and Quizes	13
Criteria performance of internal combustion engines (spark and Diesel), including power output , thermal efficiency , specific fuel consumption and mean effective pressure and volumetric efficiency (Turbo and Supercharger).	14
End term exam	15
The Second Smister	
Revision of air-standard cycles	1
Introducing fuel-air cycles, Constant volume and Constant pressure fuel-air cycles, definition and calculations.	2
Deviation of actual engine cycles from air and fuel-air cycles.	3
Combustion phenomena in spark ignition engines, (normal and abnormal combustion), Knock in spark in spark ignition engines, factors effect Knock , affect of Knock	4
Combustion phenomena in compression ignition engines, (heat released diagram), stages of combustion in compression engine, ignition delay	5
Gas turbine cycles , simple cycle mode and calculation	6
Modified cycles applied to power plant, regenerative gas turbine cycle	7
Gas turbine with two-stage compression and two-stage expansion cycles	8
Performance of gas turbine including power output and so on.	9
Short exams and tetorial	10
Gas turbine used as an air craft engines	11
Turbo propeller , turbo fan , turbo jet engines	12
Ramjet engine and their application	13

Air pollution , pollutants emitted from spark and diesel engines such as CO, HC, NO_x	14
Methods for reducing emission from engines, catalytic convertor, REG etc	15

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Labaratories 2
Course Number/Type: **ME 321**
Credit Hours: **(0-3-0)2** hours/week
Level/Term: **3rd** level
Prerequisties:

Course Description:	
Refernces:	
1- …. **2- ….**	
Course Details:	
Subject	**Week**
Centrifugal Force Measurement Experiment.	1
Dynamic Balancing Experiment.	2
Pelton Turbine Experiment.	3
Centrifugal Pump Performance Experiment.	4
Forced Convection from a Cylinder in Cross Flow Experiment.	5
The Conduction Analogue Experiment.	6
Determination of Thermal Conductivity of Metals Experiment.	7
Gyroscopic Effect Experiment.	8
The Hartnell Governor Experiment.	9
The Behavior of Two Centrifugal Pumps Working in series and Parallel Experiment.	10
Study of the Spark Ignition Engine Experiment.	11
Forced Convection from a Tube Bank in Cross Flow Experiment.	12
Heat Pump Experiment.	13
Centrifugal Force Measurement Experiment.	14

Dynamic Balancing Experiment.	15

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Manufacturing Processes
Course Number/Type: ENME306/yearly
Credit Hours: 6 **(2-2-0)** hours/week
Level/Term: 3th class
Prerequisties: Manufacturing processes/1

Course Description:

The fundamental goal of manufacturing process is to produce a product that has a useful form. Manufacturing process is one of the important steps in production process. It mainly concerns with the change of form of material or dimensions of the part being produced. Transportation, handling or storage of parts does not comes under steps of manufacturing process, because these steps are not involved with the change of form of material or dimensions of the part being produced. The geometry of the finished product must have certain tolerances, that it must meet in order to be acceptable and being useful. The three different types of functions that involve in manufacturing process are as follows:
To change the physical properties of the raw material.
To change the shape and size of the work piece.
To produce required dimensional accuracy (tolerances) and surface finish.
The different types of manufacturing process that are classified based on nature of work are shown below.
Forming processes involves the following: drawing, forging, rolling, extrusion
Metal working processes involves the following: Rolling, forging, extrusion, wire drawing
Machining Processes involves the following: Turning, drilling, milling, grinding
Joining processes involves the following: Fusion Welding, Arc Welding
Casting Processes involves the following: Sand Casting, Permanent mould casting, die casting, Centrifugal casting

Refernces:

1- Mikell P.Groover. "FUNDAMENTALS OF MODREN MANUFACTURING _ MATERIAL PROCESSES AND SYSTEM". John Wiley and Sous. 2002. (can be downloaded from the Course web page).
2- B.H. Amsted, Philip F. Ostward and Myron L.' MANUFACTURING PROCESSES' Begman Jhon Willey Sons-Inc 2005.

Course Details:

Subject	Week
Metal Forming - Introduction, Material behavior, Flow stress	**1**
Forming temperature - Cold Forming, Warm Forming Hot Forming	**2**
Rolling Operation - Analysis of Flat Rolling, Neutral point	**3**
Forging - Open –Die Forging, close –Die Forging	**4**
Extrusion Process - Direct and indirect extrusion, analysis of Extrusion, impact extrusion	**5,6**
Wires and Bars Drawing - Analysis of wire drawing, bars drawing	**7**
Powder Metallurgy Techniques - Characteristics of metal powders, property of Engineering powders, production of metal powders.	**8**
Welding Processes - Introduction Fusion Welding, Arc Welding, TIG-Welding, MIG-Welding	**9,10**

Mid. Term Exam	**11**
Submerged Arc Welding ,Plasma Arc Welding, Thermite welding	**12**
Flash Welding, Electric Resistance Welding :Spot, seam ,Projection	**13**
Oxy- acetylene Welding, Solid phase welding: Friction welding	**14**
1st Term Exam	**15**
Second semester	
Machining Processes, introduction, types of cutting operations	**1**
Theory of chip formation in metal machining process - Forces in metal cutting, Power and energy relations in cutting operations	**2**
Turning and related operations - Milling operations	**3**
Drilling operation ,Grinding Operation	**4**
Material of cutting tools, Tool Geometry, Tool failure and Wear, Tool Life, Economics of Metal Cutting,	**5**
Numerical Control(NC) - Analysis of NC Positioning Systems, NC Part Programming .Application of NC)	**6,7**
Mid. Term Exam	**8**
Non-traditional Machining Processes - Electric Discharge Machining(EDM), Wire Cut , Electrochemical Machining Processes, Ultrasonic Machining	**9,10**
Casting processes: Introduction ,Melting and Pouring of Metal, Design of Riser , Sand casting Shell moulding	**11,12**
Investment casting, Permanent mould Casting	**13**
Permanent mould Casting, Centrifugal Casting, Furnaces ,Casting defects	**14**
Final Examination	**15**

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Mechanics of Machines
Course Number/Type: ME313
Credit Hours: 3 (2 lecture and 1 Application hours/week)
Level/Term: Yearly
Prerequisties: Engineering Mechanics, Strength of Materials, Mathematics.

Course Description:

This course is intended to cover the essential theories and techniques of kinematics, kinetics and dynamics analysis of machines and mechanisms. An Introduction to theory of machines, definitions, basic concepts, simple mechanisms and machines. Fast review on engineering mechanics: displacement, velocity and acceleration, relative motion, circular motion, torque and angular motion, simple harmonic motion. Position analysis in machines and mechanisms: introduction, coordinate systems, methods for determinations for positions (Graphical, Analytical and Vector loop methods). Velocity analysis in machines and mechanisms: introduction, absolute and relative velocity, velocity of a point on the link, velocity of sliding block on rotating link, methods for determinations for velocities (Relative velocity diagram (Graphical), Analytical or algebraic and instantaneous center methods), rubbing velocity. Acceleration analysis in machines and mechanisms: introduction, methods for determinations for accelerations: (Acceleration diagram Method (Graphical), acceleration of block sliding on rotating link. Forces in links, analytical or algebraic methods for determination of accelerations). Balancing of rotating masses: introduction, Static balance, dynamic balance, balancing of rotating masses in same plane, balancing of rotating masses in different planes, Graphical Method, Analytical Method, Dynamic Forces in Bearings. Balancing of reciprocating masses: introduction, reciprocating Masses, Methods for solving problems. Friction and wear: introduction to wear and friction (Tribology), Types of wear and Friction, Applications of friction in engineering. Clutches systems: introduction, principle of Clutch, Types of Clutches, positive and Friction Clutches, Types of Friction Clutches: Plate or Disc Friction Clutches, (Single and Multi-Disc Clutches, Cone or Conical Friction Clutches, Centrifugal Friction Clutches. Brakes systems: Introduction, Types of Brakes, Application of Brakes in Machines, Method of Analysis. Belts, ropes, and chain drives: Introduction, Definition and Applications, Types, Flat, Rope and V-Belts Drives, Force Analysis, power transmitted, Efficiency, Slips. Gyroscopes: gyroscopes

application: ships, airplanes, etc. Gyroscope motion, Gyroscope couple analysis. Turning moment diagrams and flywheels: introduction and definitions, Crank effort diagrams, Fluctuation of speed, Fluctuation of energy. Governors: Introduction, Types of Governors, Dead Weight Governors and Spring loaded governors: Watt governor, Porter governor, Hartnell governor, Proell governor, Complete forces analysis, Controlling force and stability, Sensitivity and insensitivity of governors. Tooth gears: introduction, Types of Gears, Applications, Force analysis in spur gear. Cams: Introduction, Types of desired motion, method of analysis and designing of cams. Universal joints, complete analysis.

Refernces:

Course Text Books:

- **Mechanics of Machines, (Elementary and Examples), by: J. Hannah and R. C. Stephens, all editions, 1984, 2017,**
- **Mechanics of Machines, (Advanced and Examples), by: J. Hannah and R. C. Stephens, all editions, 1984, 2017,**
- **Mechanics of Machines, by Cleghorn, W. L., Oxford University Press, First, and Second Editions, 2005, 2009, 2015.**
- **Theory of Machines, by: R. S. Khurmi and J. K. Gupta, First-Edition 2010.**
- **Theory of Machines, by: Thomas Bevan, C.B.S. Publishers.**
- **Theory of Machines, by: S. S. Ratan, Tata McGraw Hill.**
- **Theory of Machines, by: P. L. Ballaney, Khanna Publishers, India- Delhi.**

Course Reference Books :

- **Theory of Machines, by Robert L. Norton, all editions.**
- **Design of Machinery, by Robert L. Norton, all editions.**
- **Theory of Machines and Mechanisms, by John, J. U., Gordon R.P., and Joseph E. Shigley, Oxford University Press, Fifth Edition, 2017.**
- **Theory of Machines, by R. K. Bansal.**
- **Theory of Machines, by W. G. Green, Bluckie and Sons Limited.**
- **Or any related books.**

Course Details:

Weekly Teaching Plan:

Week 1	**Introduction to Mechanics of Machines**
	❖ **Introduction to theory of machines, definitions, basic concepts, simple mechanisms and machines, showing mechanisms and machines using mini data show.** ❖ **Fast review on Engineering Mechanics : displacement, velocity and acceleration, relative motion, circular motion, torque and angular motion, simple harmonic motion.**
Week 2&3	**Introduction, Positions analysis and Velocity analysis.**
	❖ **Position analysis in machines and mechanisms: introduction, coordinate systems, methods for determinations for positions (Graphical, Analytical and Vector loop methods), solved examples, tutorial sheet #1.** ❖ **Velocity analysis in machines and mechanisms: introduction, absolute and relative velocity, velocity of an point on the link, velocity of sliding block on rotating link, methods for determinations for velocities (Relative velocity diagram (Graphical), Analytical or algebraic and instantaneous center methods), Rubbing Velocity, solved examples, tutorial sheet #2.**
Week 4,5,6	**Introduction to Acceleration analysis**
	❖ **Acceleration analysis in machines and mechanisms: introduction, methods for determinations for accelerations: (Acceleration diagram Method (Graphical), Acceleration of Block Sliding on Rotating Link. Forces in Links.**
First Quiz # 1	
Week 7&8	**Continued..... Analytical or algebraic Methods for determination of accelerations),**

	Solved examples and tutorial sheet #3.
Second Quiz # 2	
Week 9&10	**Introduction to Balancing of Machinery's**
	❖ **Balancing of Rotating masses: introduction, Static Balance, Dynamic Balance, Balancing of rotating masses in same plane, Balancing of rotating masses in different planes, Graphical Method, Analytical Method, Dynamic Forces in Bearings, Solved Examples, tutorial sheet #4.** ❖ **Balancing of reciprocating masses: introduction, reciprocating Masses, Methods for solving problems,**
Solved Examples, tutorial sheet #5.	
Week 11, 12&13	**Introduction to wear and friction (Tribology)**
	❖ **Friction and wear: introduction to wear and friction (Tribology), Types of wear and Friction, Applications of friction in engineering.** ❖ **Clutches systems: introduction, principle of Clutch, Types of Clutches, positive and Friction Clutches, Types of Friction Clutches: Plate or Disc Friction Clutches, (Single and Multi-disc Clutches, Cone or Conical Friction Clutches, Centrifugal Friction Clutches, Solved Examples, tutorial sheet #6.**
Week 14	**Introduction to Brake systems**
	❖ **Brakes systems: Introduction, Types of Brakes, Application of Brakes in Machines, Method of Analysis, Solved Examples, tutorial sheet #7.**
Third Quiz # 3	
1st Term Examination	
Week 1&2	**Belts, Ropes and Chains Drives**
	❖ **Belts, ropes, and chain drives: Introduction, Definition and Applications, Types, Flat, Rope and V-Belts Drives, Force Analysis, power transmitted, Efficiency, Slips, Solved Examples, tutorial sheet #8.**

Week 3&4	**Gyroscope motion and couple**
	❖ **Gyroscopes: gyroscopes application: ships, airplanes, etc. Gyroscope motion, Gyroscope couple analysis, Solved examples, tutorial sheet #9.**
Week 5,6&7	**Flywheel and Turning moment diagrams**
	❖ **Turning moment diagrams and flywheels: introduction and definitions, Crank effort diagrams, Fluctuation of speed, Fluctuation of energy, Solved examples. Tutorial sheet #10**
Fourth Quiz# 4	
Weeks 8&9	**Governors:**
	❖ **Governors: Introduction, Types of Governors, Dead Weight Governors and Spring loaded governors: Watt governor, Porter governor, Hartnell governor, Proell governor, Complete forces analysis, Controlling force and stability, Sensitivity and insensitivity of governors, Solved examples. Tutorial sheet #11.**
Weeks 10&11	**Gears and Gears Trains**
	❖ **Tooth gears: introduction, Types of Gears, Applications, Force analysis in spur gears, solved examples.**
Week 12	**Cams Design and Analysis**
	❖ **Cams: Introduction, types of cam and follower mechanisms, Types of desired motion, method of analysis and designing of cams profiles.**
Week 13	**Universal Joints**
	❖ **Universal joints: Complete Analysis**
Fifth Quiz#5	

2nd term Examination		
Week 14	**Final Examination**	

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Air Conditioning & Refrigeration
Course Number/Type: ME413
Credit Hours: 4 (3 lecture and 1 Tutorial hours/week)
Level/Term: 4th level / yearly
Prerequisties: Thermodynamics, Heat Transfer, Fluid

Course Description:

Defining air conditioning and several basic terms, effect of surrounding air on human body, moist air properties, psychrometric chart, calculating moist air properties based on perfect gas formulations, Human thermal comfort, selecting indoor and outdoor design conditions, Psychrometry and psychrometric basic processes, sensible and latent heat, air mixing and basic air conditioning cycles, Heat transfer through building envelope, solar energy basics, solar heat gain, calculating the shading area on a window, heating and cooling load calculation, Ventilation and infiltration, ducting system, types of air conditioning system, controls. Defining refrigeration, principle of obtaining refrigeration effect, Vapor Compression (V.C.) refrigeration, advanced V.C. refrigeration cycles, basic and auxiliary components of refrigeration system, controls on V.C. refrigeration system. Description of sorption refrigeration system, Description of modern air conditioning and refrigeration systems (VRV).

Refernces:

1- Fay.C. Mc. Quiston, Jerald D. Parker, "Heating, Ventilating, and Air Conditioning", 4thed., John Wiley & Sons, Inc., New York, 1994.
2- W.P. Jones, "Air Conditioning Engineering", 2nd ed, Edward Arnold, Bell and Bain Ltd, Glasgow, 1973.

Course Details:

Subject in First term	Week
Introduction + Properties of moist air	1
Thermal comfort indices, Inside design conditions, outdoor design conditions.	2
Psychrometry + Tutorial	3
Practical air conditioning processes and air conditioning cycles + Tutorial	4&5
Practical air conditioning processes and air conditioning cycles + Tutorial	6&7
Fundamentals of solar energy for calculating shaded area + Tutorial	8
Fundamentals of solar energy – effect of solar radiation on building envelope	9
Environmental freshness & supply design conditions	10
Heating and Cooling Load Calculation + Tutorial	11&12
Ducting System Design + Tutorial	13
Central Air Conditioning Systems & Control in A/C	14
End of Term Exam	15

Subject in Second term---------- Rerigeration	Week
Methods of Obtaining Refrigeration	1
Thermodynamics of vapor compression refrigeration system + Tutorial	2&3
Advanced Vapor Compression cycles + Tutorial	4&5
Mechanical Elements of Practical Vapor Compression Refrigeration System	6&7
Compressor Volumetric Efficiency + Tutorial	8
Refrigerants + Tutorial	9&10
Controls and Safety of a Refrigeration System.	11
Vapor sorption refrigeration system and thermoelectric refrigeration	12&13
VRV Refrigeration system	14
End of Term Exam	15

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Control and Measurements
Course Number/Type: ENME412
Credit Hours: 4(2-0-1)
Level/Term: Forth Class
Prerequisties:

Course Description:

The subject of control and measurements is instructed to the final year, (4th year), in the department of mechanical engineering. The major part of the subject is the so called classical control, which comprises basics but essential to this wide multi-display field. Classical control starts by establishing transfer function for components or sub-systems. In other words modeling of different components or sub-systems is performed using the first principles. Most of the engineering relationships are non-linear, then linearization is needed so that the linear control theory can be applied. Modeling of mechanical, thermal, fluidic and electrical components are represented by blocks so that subsystem or complete control system's block diagrams are established. Field controlled DC motors and armature controlled DC motor driving mechanical subsystem are represented by block diagrams. Other actuators such as hydraulic is presented too. Prior to introducing the feed-back control, the block diagram algebra is to be studied for block diagram reduction. For different application, a complete control systems are constructed with their block diagram. Steady-state operation is found useful to realize the feedback principles and to estimate some of system parameters. A review of Laplaces transform is given for different function including those normally used in control systems. Reference to different inputs are to be determined for different cases. Routh-Hurwitz stability criterion is applied to characteristic equation of systems. The principle of root locus and their plot are given for feedback control systems. An introduction to polar plot and frequency response are given. As far as, the measurement part is considered it is given in such a way to serve the construction of a complete control system, as the feedback sensors is a sub-system appears as a part of the complete control system. This is because the measurement is a very wide subject. Different measuring devices and sensors for temperature, pressure, flow rate, speed, force …etc., are covered in addition to those given through different control system with different applications.

Refernces:

1. Text book: Automatic control engineering by Francis H. Raven Third Edition.
2. Reference books: Modern Control Engineering, by Katsuhiko Ogata Fifth Edition.

Course Details:	
Subject	**Week**
General introduction on the subject of control & measurements in different branches of engineering. Mech. Elect. Chem. Civil prod. ..etc.	1
Basic requirements for the subject and the connection between control and measurements (measurements here means sensors) giving some example& the contents of the subject.	1
Definitions of terms and the meaning of transfer function, and why Laplaces transforms. Open loop and closed loop systems.	2-3
Representation of control systems components, mechanical rotational, fluidic, thermal and electrical. First-order system and time constants for different sub-systems.	4-5
Dynamic equations and block-diagram representation of some actuators normally used in control systems, hydraulic integrator and hydraulic actuator, field-controlled D.C motors and armature-controlled D.C motors.	6-7
Linearization of non-linear relationships and why it is needed in control system representation. Hydraulic actuator with load as an example on linearization and other examples.	8-9
Block diagram algebra and simplification rules, solving an example on simplification. Examples on complete control and building block diagrams with reference input and disturbances.	10-11
Steady state operation and the evaluation of steady state block diagram constants. Steady s. equation of operation, controller and system to be controlled characteristic curves.	11-12
Lecture on measurements &sensors, temperature, pressure & rotational speed.	13-14
1st Term Examination	15
Laplaces transform in general and for different input functions. Final value theorem.	Week 1
Roots of functions, poles and zeros in transfer functions. Real and complex roots.	2
System type. Steady state errors, positional, velocity, and acceleration.	3
Transient response in control systems .system characteristic equation. Systems with distinct, repeated and complex conjugate roots.	4-5
.Performance of second order system .damped and un damped Natural frequencies , damping ratio, under damped and over damped system, over shoot settling time …etc.	6-7
Stability of control systems, roots plot on s-plane, Routh's- Hurwitz	8-9

stability criteria.	
Root- locus for control systems on s-plane and its construction , Introduction to frequency response analysis and design.	10-11
Lectures on measurements & sensors for flow of fluids, force & loads measurements, depth gauges.	12-13
General revision	14
Final Examination	15

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Electrical Engineering II
Course Number/Type: ME 401
Credit Hours: 2 (2lecture and 0 laboratory hours/week)
Level/Term: 4st level
Prerequisties:

Course Description:	
Passive and active filter circuit design, Butterworth filter design, transient analysis by classical methods and by Laplace Transform analysis, step and impulse response, two-port networks, Introduction to Fourier Series, three phase circuits.	
Refernces:	
تقنيات الهندسة الكهربائية / 1991 أ. د. فاروق خليل عموري والسيد اودا ابلحد يونان	
Course Details:	
Subject	**Week**
Power Generation	1-2
The Power supply	3-4
Electrical Transformer	5-6
D.C Machines	7-8
A.C Machines	9-10
Synchronous Machines	11-12
Over Head Transmission Lines &Underground Cables	13-14
Electrical Power Technology	15-16
Rectifiers	17-18
Transistors	19-20
Electrical Measurements and Measurement Instruments	21-22
Electrical Measurements and Measurement Instruments	23-24
Review the Picture of all above by (Data Show)	25-26
Review the Picture of all above by (Data Show)	27-28
Review the Picture of all above by (Data Show)	29-30

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Engineering Materials
Course Number/Type: ME 417
Credit Hours: 2(2 lecture hours/week)
Level/Term: 4th level / 2ed Term
Prerequisties: Metallurgy & Production Methods

Course Description:

The course will be divided into two categories: metallic and non-metallic materials.The first will study the metallic materials will include binary and ternary equilibrium diagrams, strengthening mechanism, ferrous alloys, non ferrous alloys , failure theories,fatigue and creep.The second category non-metallic materials: polymers, ceramics, composites andNanomaterials as related to their atomic structure mechanical properties , manufacturing & usage.

Refernces:

1-Materials Science and Engineering: An Introduction; by William D. Callister Jr. and David D. Rethwisch, Eighth Edition, 2010.
2- The Science and Engineering of Materials; D. R. Askeland PWS Print version 2011

Course Details:

Subject	**Week**
Introduction to polymer and polymerization.	1-2
Polymers, Polymerization, Polymer types , plastic additives,Recycling of plastic	3-4
Plastic Processing Techniques .	5-6
Plastic processing ,Injection Molding, Extrusion Molding, Blow molding, vacuum molding, foaming, Rotational Molding, Calendering , Molding defects.	7-8
Introduction to Ceramic Materials ,Fundamentals of Powder Metallurgy	9-10
Ceramic materials, Ceramic structures, Ceramic processing ,Mechanical properties	11-12
Powder Metallurgy, Sintering, Characteristics of the metal powders,Manufacturing of Metal Powders	13-14
Type of Composite Systems	15-16
Metal Matrix Composites Manufacturing of MMC, Ceramic matrix composites	17-18
Manufacturing of CMC, Carbon–Carbon Composites, Analysis of mechanical property of composite	19-20
Polymer Matrix Composites, Manufacturing of Polymer Matrix	21-22
Introduction to Nanomaterials	23-24
Nanomaterials, Classification of Nanomaterials, Methods for creating nanostructures	25-26
Introduction to conductor and semiconductors	27-28
Manufacturing of semiconductors	29-30

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Industrial Engineering
Course Number/Type: ENME 402
Credit Hours: 2 hours/week)
Level/Term: Class:**4th**

Prerequisties: Industrial Management , Manufacturing Processes,

Course Description:

Since industrial engineering represents the application of the engineering methods for all factors of industrial or service activities, including the human factor, and the applied engineering sciences, humanities and economic sciences , through analysis – planning – organization - development and improvement to obtain the best performance and the best value with the lowest cost , so this study module Includes topics that enhance student knowledge and provide him with the basic information for this important knowledge aspect. It is also useful for understanding some of the practical basics of the labor market and understanding the concepts of managing productive and service engineering projects

Refernces:

1- ترجمة د. فكتور يوسف توفيق **Introduction To Industrial Engineering, Richard C. Vaughn**
2 - أ د عبد الكريم محسن ,2009,الطبعة الثالثة ادارة الانتاج والعمليات **Production and Operation Management**
3- أ.د غسان قاسم اللامي , 2008 ادارة الانتاج والعمليات مرتكزات معرفية وكمية
4- 1987 بحوث العمليات وتطبيقاتها , أ.د خالد جرجيس عبو , الجامعة التكنولوجية , بغداد
5- كتاب مترجم **Management Mistakes And Successes . Robert F. Hartley , Cleveland University , 2000**
6- مواقع علمية رصينة على شبكة الانترنت
7- التخطيط الاستراتيجي ،عرض نظري وتطبيقي ، 2009، د.مجيد الكرخي

Course Details:

Subject	Week
• Industrial Engineering (Definitions)	1
• Industrial Engineering (Terms and concepts)	2
• Plant Location (Consept and significance)	3
• Plant Location (The Consequences of trade-offs)	4
• Plant Location Methods Of Plant Location(Qualitive , Break-Even analysis	5
• Plant Location Transportation Network Method	6
• Plant Location Gravity method	7
• Project Management	8
• Process flow design	9

• Projects Selection Methods	10
• Pert Chart and critical path analysis	11
• Project Control, Gantt Chart	12
• Project Control, Gantt Chart	13
• critical path analysis	14
• Specifications and quantities	15
• Facility layout (The Planning –Significance)	16
• Facility layout Types of Facility layout	17
• Facility layout Types of Facility layout	18
• Facility layout Balancing of Assembly Line	19
• Work Station,Task, Cycle Time	20
• Work Station,Task, Cycle Time	21
• Methods of activity distribution	22
• Product/Service planning and development	23
• Product/Service planning and development 2	24
• Quality Control	25
• Inventory control 1	26
• Inventory control 2	27
• Tenders and contracts	28
• Automation and robotics	29
• troubleshooting diagnosis	30

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Mechanical laboratory
Course Number/Type: ENME423
Credit Hours: 3(0lecture and 3 laboratory hours/week)
Level/Term: 4st level / Spring
Prerequisties: heat transfear, contrl, vibration

Course Description:

In this year it will be carry out the following experiments
Types of non return valve used in pneumatric control cercuits
Industrial robot application simulation of quality control
Forced Vibration Of A Rigid Body - Spring System With Negligible Damping
Torsional oscillation of single rotor with viscose damping
Non distractive test
ExperimentalCalculationOf the Coefficientof performance(COP
The hardenability of different types of steels.

Refernces:

Data sheets for the experiments. (Can be downloaded from the Course web page)

Course Details:

Subject	**Week**
Introduction, Dividing Students into Groups	1
Types of non return valve used in pneumatric control cercuits	2
Industrial robot application simulation of quality control	3
Forced Vibration Of A Rigid Body - Spring System With Negligible Damping	4
Torsional oscillation of single rotor with viscose damping ExperimentalCalculationOf the Coefficientof performance(COP	5
Non distractive test	6

The hardenability of different types of steels	7
Electrical refrigeration	8
Electrical refrigeration	9
Writing technical reports, re-reading and writing down data for some experiences	10
Writing technical reports, re-reading and writing down data for some experiences	11
Writing technical reports, re-reading and writing down data for some experiences	12
Writing technical reports, re-reading and writing down data for some experiences	13
Writing technical reports, re-reading and writing down data for some experiences	14
Final exam	15

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Machine Design

Course Number/Type: ME411

Credit Hours: 5 (4 lecture and 0 laboratory hours/week)

Level/Term: 4th level / Spring

Course Description:

An introduction to the fundamental of Mechanical engineering, type of Machine loads and their various stresses generated on the machine members, introduction to clutches, their purpose, how they work, in general and, developing a mathematical set of equations to calculate the outline dimensions of a friction type of clutches, whether they are of single disk or multiple disk clutch, introduction to brakes, their purpose, and how they work, in general. The development of mathematical set of equations to calculate the outline dimensions of a friction type of brakes and their torque capacity, whether they are of internal or external drum brakes. Introduction to Gears, which include the Classifications of gears, Gear theory, Gear ratio. Spur gear Design aspects of gears using Lewis formula of design for bending stress and for contact stress. Design aspects using AGMA design formulas for bending and contact stresses. Introduction to Hydraulic and pneumatic Power. Introducing the various parts of a hydraulic and pneumatic circuit, Pumps (gear, piston and vane). Valves (Directional ,Flow and Pressure). Actuators, Piping. Design of power screws. Design of a small mechanical machine (As an example, Conveyor belt, Hoist, Lift, Toggle Mechanism of injection molding machine, Hydraulic press). Introduction of Machine design using computers, Auto Desk INVENTOR program is used in the design of shaft, bearings, gears and fasteners of a design example of a gear box, throughout the course Excel is used as a calculator to recalculate the results of tutorial example but for different scenarios, to get a broad picture.

Refernces:

1- Machine Design: An Integrated Approach, Robert L. Norton, Pearson Prentice Hall. 1995

2- Mechanical Design, Peter R.N. Childs, Elsevier, 2003

3- Shigley's Mechanical Engineering Design. J. K. Nisbett & R. G. Budynas. 2006

Course Details:

Subject	Week
Introduction to Machine Design	1
Design of Clutches	2
Design of Clutches	3
Design of Brakes	4
Design of Brakes	5
Design of Brakes	6
Design of Gears	7
Design of gear using Lewis formula	8
Design of gear using Lewis formula	9
Design of Gears using AGMA equations	10

Design of Gears using AGMA equations	11
Design of Gears using AGMA equations	12
Review	13
First Term Exam	14 & 15
Introduction to Fluid power	16
Fluid power	17
Fluid power	18
Fluid power	19
Fluid power	20
Design of a hydraulic Press	21
Design of a hydraulic Press	22
Design of power screws	23
Design of power screws	24
Introduction to INVENTOR	25
Review of the design process	26
Review of the design process	27
Review of the design process	28
Final Exam	29 &30

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Power Plant
Course Number/Type: ENME415
Credit Hours: 2 (2lecture and 0 laboratory hours/week)
Level/Term: 4st level / Spring
Prerequisties: Thermdynamic

Course Description:

Provides the student with an introduction to power plant, the major types systems and components that make up a power plant. Students learn how electric power is produced and distributed and learn the load curve how to calculate different factors (load, diversity, used and demand factor … etc.), what the thermodynamic cycles used in power plant and specific attention is given to regeneration (close and open feedwater heater), cogeneration, binary and combined cycle, how boilers, turbines, and condensers operate. This course covers, boiler and heat recovery steam turbine types with their components (economizer, super heater, preheater), also types of cooling towers and condensers. Allows students to study the major elements that make up gas and steam turbines. This course also covers the types and major component of hydroelectric and nuclear power plant

Refernces:

1- Power Plant Engineering, P.K. Nag, McGraw hill. 2008
2- Thermodynamics an Engineering Approach, Yunus A. Gengel, Michael A. Boles, Fifth Edition, 2006
3- Boiler Operation Engineering: Question and Answers. Chattopdhyay, P. 2nd, Edition, 2001
4- Power Plant System Design, Li W., Priddy P., John Wiley & Sons, Canada 1985

Course Details:

Subject	**Week**
Gas turbine power plant	1-2
Gas turbine power plant tutorial	3-4
Combined cycle power plant	5-6
Binary cyle	7-8
Tutorial	9-10
Monthly exam	11-12
Boiler introduction clasification	13-14
Boiler Components Economizer evaporator and superheater	15-16
Some Common Boilers, benson boiler, lamont boiler	17-18

Boiler calculations	19-20
Tutorial	21-22
Hydroelectric introduction , 3. Advantages and disadvantage of Water Power classifications	23-24
main elements of hydroelectric power plant, hydroelectric turbine	25-26
Tutorial and quiz	27-28
Final Exam	29-30

University of Mosul

College of Engineering

Department: Mechanical Engineering

Course Title: Vibration
Course Number/Type: ME 414/Core
Credit Hours: 4)
Level/Term: 4th level
Pre-requisites: Statics and Dynamics

Course Description:

This course provides a brief review of fundamentals of dynamics and general information about vibratory systems (components and physical effects). The dynamic behavior of vibratory systems are included in this course. The degrees of freedom and generalized coordinates are taught. Different types of vibratory systems are classified and illustrated as:

- Single degree of freedom systems.
- Un-damped free vibration and damped free vibration.
- Stability of the vibratory systems.
- Vibration measuring instruments.
- Forced vibration.
- Vibration of two and multi degrees of freedom systems.

References:

1- Engineering Vibrations, William J. Bottega, 2013, Taylor & Francis Group, LLC, USA.
2- Mechanical Vibrations, Singiresu, S. Rao, Fourth Edition (Revised), 2005, Prentice Hall, NJ, USA.

Course Details:

The mathematical models of the physical systems are explained and the dynamic behavior of the vibratory systems based initial conditions are analyzed analytically. A different methods, newton's law method, energy method, and equivalent method, are used for fully solved examples. Stability of systems and vibration measuring instruments are described. The vibration of two degree freedom systems are explained and analyzed based general approach.

Subject	**Week**
➢ Briefly review of the principles of dynamics. ➢ Introduction, Basic Definitions and Concepts of mechanical vibration.	1-2
➢ Dynamic behavior of vibratory systems (periodic, non-periodic and random motions). ➢ Classification of oscillation	3-4
➢ Reduction of mechanical system vibration. ➢ Examples (spring – mass system and pendulum).	5-6
➢ Degrees of freedom and generalized coordinates. ➢ Components of vibratory systems (inertia, constraint elements and interlinking elements).	7-8
	9-10

➢ Equivalent of spring, mass and damper. ➢ Examples. (Fully solved of problems and use different visual media for real world applications). ➢ Tutorial sheet No.1 Homework 1	11-12
➢ Free un-damped vibration of single degree of freedom system. ➢ Derive equation of motion, calculate the natural frequency, and determine the dynamic behavior of the system based initial conditions.	13-14
➢ Examples (fully solved of problems). ➢ Tutorial sheet No.2 Homework 2	15-16
➢ Free damped vibration of single degree of freedom system. ➢ Viscous, coulomb and hysteretic damping.	17-18
➢ Examples (fully solved of problems for real world applications). ➢ Tutorial sheet No.3 Homework 3	19-20
➢ Forced un-damped vibration of single degree of freedom systems. ➢ Examples (fully solved of problems). ➢ Tutorial sheet No.4 Homework 4	21-22
➢ Vibration isolation. ➢ Vibration reduction devices.	23-24
➢ Examples (fully solved of problems). ➢ Tutorial sheet No.5 Homework 5	25-26
Free and forced Vibration of two degrees of freedom systems. Part1	27-28
Free and forced Vibration of two degrees of freedom systems. Part2	29-30